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DEC 16 1957

CONGRESS

PIPE LINE INDUSTRY

DECEMBER
1957

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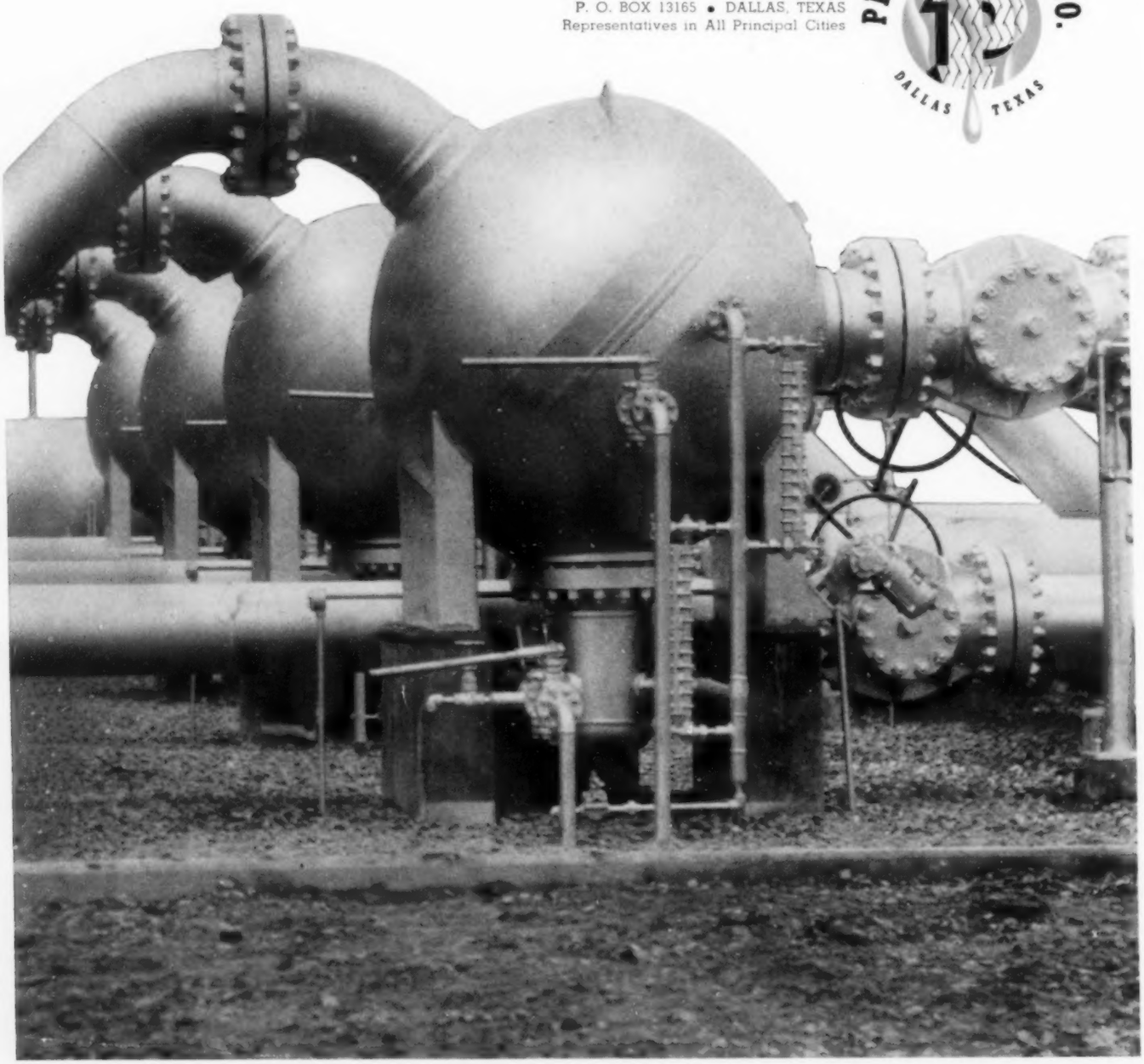

DEC 16 1957

PIPE LINE INDUSTRY

CONTENTS and Quick Look

December, 1957 Vol. 7, No. 6

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Glycol for Natural Gas Dehydration

☐ Liquid dessicants are generally used in the dehydration of natural gas. Diethylene and triethylene usually have been the most practical. Certain chemical and physical properties of these materials must be considered in the design and operation of dehydration units.

By K. Gene Mitchell ..... Page 36

SP's New Products Line Conquers Rugged Sierras

☐ Contractors overcame a variety of tough conditions in completing Southern Pacific Pipe Lines' new 312-mile line from the San Francisco Bay area to western Nevada. Right-of-way climbs to more than 7100 feet in crossing Donner Summit; Rock work, blasting and numerous river crossings were included in this mountain construction job.

By Gilbert M. Wilson ..... Page 41

Boring Pipe Line Crossings in Marsh Aided by Cofferdams

☐ Here's a picture story of how a contractor used cofferdams to provide dry working area for boring railroad and high crossings. Working in the marsh area of South Louisiana, an area large enough for the boring machine and one joint of casing was provided. Operations were conducted from a barge..... Page 44

Beat the Freeze!

☐ Anhydrous ammonia has provided effective in controlling hydrate formation in gas pipe lines. Under certain conditions, it is as effective as alcohol and easier to inject into the line. However, certain safety precautions must be observed.

By Joe Laird..... Page 46

Variable Throughput With Constant Speed Drive

☐ Changing a station from variable speed engine drive to constant speed electric motors presented problems in maintaining variable throughput. Interstate Oil Pipe Line Company varied the sizes of impellers in three pumps at the New Iberia (Louisiana) station, giving a combination which will meet any load condition expected.

By R. B. Giezentanner..... Page 47

Pushbutton Controls Switch Tanks

☐ Remotely controlled valves in the Boise (Idaho) tank farm manifold allow the Salt Lake pipe line station operator to control product flow without leaving the control room. Pipe line capacity is increased without requiring additional operating personnel. Two incoming loop lines with a single discharge line complicated design. Receipts pass through tankage to maintain product segregation.

By Benjamin W. Buzzo ..... Page 50

First Crude Moves Through Barinas Line

☐ Socony Mobil Oil Company de Venezuela and Sinclair Oil and Refining Company recently began operation of the longest big inch crude oil pipe line ever laid in Venezuela. The new 212-mile 20-inch crude line costing $26 million will deliver 100,000 barrels of Barinas Basin crude daily to the Caribbean shore at El Palito ..... Page 55

Job Evaluation—What It is and How It Can Help You

☐ Contrary to popular belief, you do not need a constultant to set up an efficient job evaluation program. All you need is to follow this step-by-step procedure as outlined by a well known industrial relations authority. Be sure to check this detailed description of the four most popular types of job evaluation in use today.

Robley D. Stevens ..... Page 58

Pipe Lines Ease Airport Fueling Problems

☐ Laying pipe lines to air fields is assuring both the air force and commercial air lines a continuous supply of fuel despite demands for greater volumes. Extension of lines to loading area relieves congestion and confusion around departing planes.

By H. T. Brundage and John C. Watts.... Page 60

Good Writing Is Easy

☐ Ability to write readable articles for technical publications and clear, concise technical reports has helped many an engineer up the management ladder. Others can do it too, by adopting these easy-to-follow "rules of thumb" used by professional writers. You will also find a handy checklist to help you in writing better technical reports.

John L. Kent ..... Page 64

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Fable of Fortune

THE OIL INDUSTRY, already in trouble over imports, may find itself in an even more precarious position unless it quits its internal sparring and collectively defends itself against a "fable of fortune" which has spread throughout the nation via prejudiced and unfounded attacks.

The industry which, since its inception almost 100 years ago, has served the nation well and has been a major contributor to the U. S. standard of living, is not even being accorded the fair treatment required for a hardened criminal suspected of a crime against society. At the bar of justice, the latter is presumed innocent until he is proved guilty by all available facts, despite tirades which may be lifted against him. However, the oil industry stands condemned at the bar of public opinion for presumed facets of its development which are pure fantasy leveled at it from uninformed and prejudiced circles, instead of receiving judgment on the basis of verified facts.

Of this, Senate Majority Leader Lyndon Johnson said recently that the public's opinion of the oil industry is potentially more dangerous to the industry than the foreign oil imports and that "it is virtually impossible for the oil industry to receive impartial, objective consideration from the bar of public opinion today."

He said there is a widespread picture of oil operators as "fat and paunchy men, lighting their $1 cigars with $10 bills and riding in Cadillacs with their eye glasses' prescription ground into the windshield."

The result of this fable of fortune, he said, is that "almost any legislative action affecting the industry can create more turmoil and debate than practically any other subject that reaches Congress."

It is time the nation-at-large accorded the petroleum industry with at least the treatment it demands for hardened criminals. That will be the first step in eradicating this fictitious picture of "rich oil men" and in supplanting it with unvarnished facts. These facts will serve as better guides to an understanding of the industry than fiction and prejudice and misinformation.

Senator Johnson is an oil-state senator, and well versed in oil industry matters. Yet, many have been quick to discredit his warnings for that very reason—often by the same persons who seek out expert advice in other fields when a need arises.

In the field of politics Senator Johnson is an experienced expert—the oil industry would do well to heed his timely and well-founded remarks. The "fable of fortune" must be dispelled before the public will give oil a fair hearing on any question.

Let's Be Careful

THE VOLUNTARY import plan should be given every opportunity to work before any segment of the industry seeks its discardment. The plan may not be perfect. However, it is better than no plan at all.

The only alternative is Congressional statutory limitation. Seeking of a Congressional import limitation likely would lead to an intensification of the bitterness which already exists within the industry. Such slashing attacks on one another are largely responsible for oil's poor understanding in public and political circles. Such inter-industry fights can only lead to further serious damage for all phases of the industry—probably to greater and greater government control.

Furthermore, it is always dangerous to ask government for any type of business control. This invariably leads to more controls than bargained for, frequently to control of entirely new phases.

This is a time for the industry to be constructive—not destructive. Let us not be short-sighted. Let us be cautious and patient.

THE Mathey TWIN!

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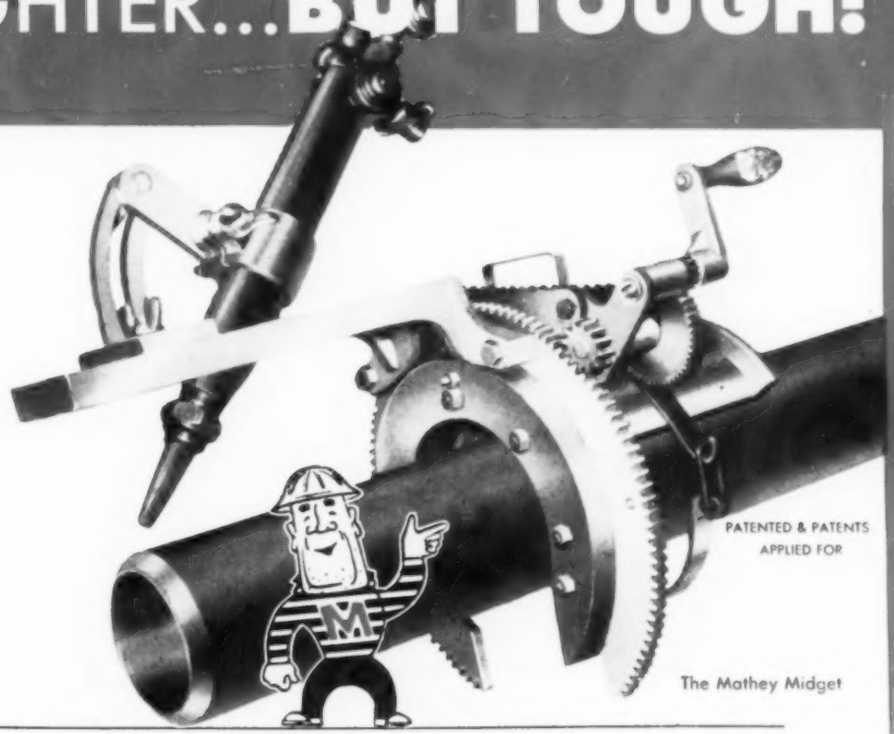

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COMPLETE RANGE OF SIZES FOR BEVELING & CUTTING PIPE FROM 1½" to 36"

Constructed of aluminum, treated with special hardening process. Approximately 41% lighter providing fatigue free durable performance. Designated as Series L, it's available in No. 3-L, No. 4-L and No. 5-L. For the lightest Pipe Cutting and Beveling Machine available, try the Mathey Twin, Series L.

The regular rugged Standard Models are available in the Midget, No. 1, No. 2, No. 3, No. 4, and No. 5. You can't beat field-tested Mathey Pipe Cutting and Beveling Machines for accuracy, speed and economy.

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"On-the-job" blood purification is not a recommended use for Dollinger Staynew Filters . . . but who knows, maybe our cartoon will start a new trend.

After all, everyone in industry today is looking for new and more efficient ways of doing things. And, when it comes to new ideas in filtration, Dollinger is ready, willing, and able. Whether you want to protect machines or processes from damage caused by dust, dirt, oil, grease, or other foreign matter, Dollinger Engineers will provide a Staynew filter to do the job efficiently and economically. Chances are your filtration problem has already been solved and there is now a *standard* Staynew Filter to handle it.

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has the exclusive "double action principle." Air is first deflected to outer walls of Filters and forced downward at high speed. Water, oil, and heavier particles of rust, etc. are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter airborne particles. This "double action" design eliminates need for frequent cleaning.

Inexpensive, simple to install, Dollinger Pipe Line Filters pay for themselves in reduced maintenance alone. Why not talk over your filtration problems with a Dollinger engineer . . . or write for Bulletin 200 which gives engineering data on pipe line filters. Dollinger Corporation, 95 Centre Park, Rochester 3, N. Y.

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WORLD OIL and THE COMPOSITE CATALOG for the drilling-producing-pipe line industry.

PETROLEUM REFINER and THE REFINERY CATALOG for the refining-natural gasoline-petrochemical industry.

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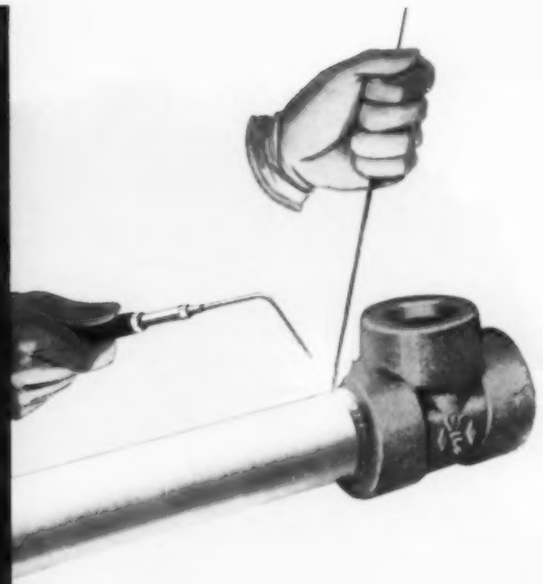
Indexed by Engineering Index and Industrial Arts Index

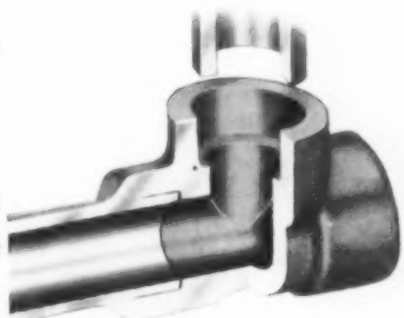
Weld Your Small Piping



the easy way

with W-S Socket-Welding Fittings

You can cut welding costs . . . and get clean, pressure-tight joints in small diameter pressure piping with W-S socket welding forged steel fittings. Welding is easy and quick. Deep sockets help support and align the pipe. Outside-the-pipe fillet weld means no welding icicles inside the pipe . . . and no need for backing rings. W-S Socket-Welding Fittings are available in sizes ⅛" to 4" in 2000, 3000 and 6000 lb. pressure classes. For resistance to high temperatures and corrosion W-S socket-welding fittings can be obtained in 3 chrome-moly alloy steels and in types 304, 316 and 304 ELC stainless steel. For detailed information write to W-S Fittings Division, H. K. Porter Company, Inc., P. O. Box 95, Roselle, N. J.



H. K. PORTER COMPANY, INC.

W-S FITTINGS DIVISION

BELL SYSTEM COMMUNICATIONS AT WORK IN THE PIPELINE INDUSTRY

Ohio Oil's Kenneth Burns, Manager, Procedures Research and Machine Accounting Division, examines payroll data tape.

How private line teletypewriters send data to fill out 6500 Ohio Oil pay checks

Payroll information on The Ohio Oil Company's 6500 employees comes into Findlay, Ohio, headquarters by private line teletypewriter service from ten distant locations as far west as California: six production and two marketing points, one refinery, and the research center in Denver.

So accurate is Bell System private line transmission that every check for every employee is correct to the last thrift plan deduction.

Among other jobs, the teletypewriter network gathers basic personnel data from distant production locations. The tape is processed through business machines. Computations are made by an electronic "brain." And pay checks are issued promptly and accurately twice every month.

Here is another case where Bell System communications meet special needs. Your requirements will receive the same thorough attention. May we suggest that you call your Bell Telephone Company business office? No obligation, of course.

BELL TELEPHONE SYSTEM

BAPTISM OF FIRE FOR THE NEW NO. 572 PIPELAYER

"It is doing a fine job in the roughest possible conditions"

There was no gentle break-in period for the new 86,000-lb.-capacity Caterpillar No. 572 Pipelayer announced in April. On one of its first jobs, it was thrust into steep, mountainous terrain, made slick and dangerous by continual rain, near Elkins, W.Va. How's it doing? Here's the answer from Ralph Gaddy, spread superintendent of Williams-Austin Co., Pittsburgh.

"It is doing a fine job in the roughest possible conditions. The design is right and the engineering is of the best."

On this rough-and-rugged job, the CAT* No. 572 Pipelayer is laying 8½ miles of 26-inch gas line for Columbia Gas System. The line will parallel an existing line starting at the Files' Creek Compressor Station.

This pipelayer needed no babying because it is the product of extensive field tests. It was engineered to produce wherever big-inch takes you. With its 19-inch ground clearance and its 86-inch track gauge, the No. 572 gives you stability in any type of terrain. And it is powered by a dependable Cat Diesel Engine rated at 128 HP at 1,200 RPM.

Operators can work at top efficiency, because the unit was designed to make their job easier and safer. The No. 572 has in-seat starting. Controls are located for convenience and positioned for frequency of use.

Here's the perfect machine to team up with the 130,000-lb.-capacity No. 583. Call your Caterpillar Dealer soon. He'll demonstrate it on *your* job . . . at *your* convenience.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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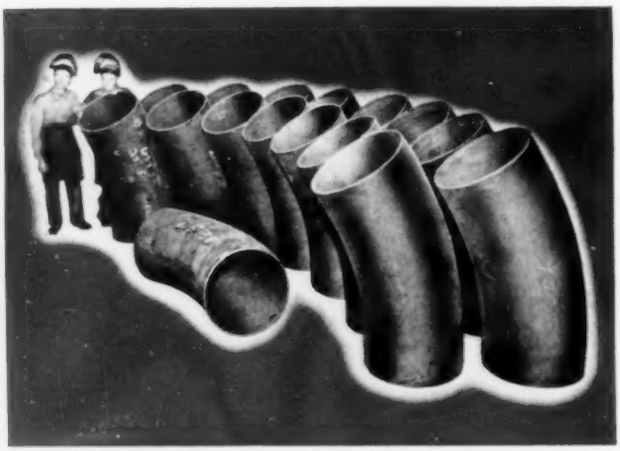
THE HARD WORK**

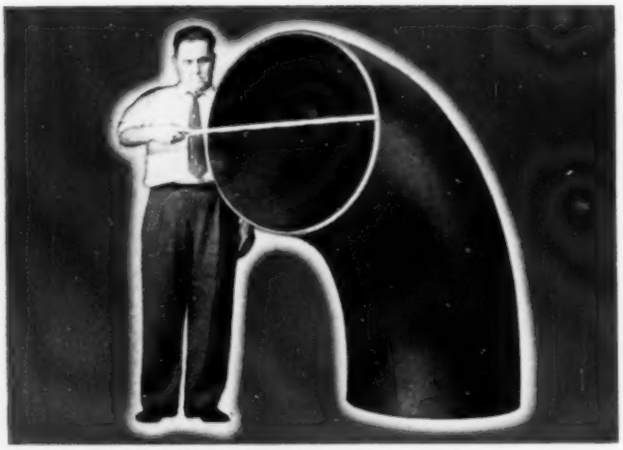
MIDWEST PIPELINE WELDING FITTINGS

SAVE TIME . . . CUT COSTS . . . SOLVE PROBLEMS



CONTOUR ELBOWS

Originated by Midwest and available in 22", 24", 26" and 30" sizes. Angles 10°, 15°, or 30° with 3D radius, providing a long sweep for easy pipe cleaning. 8" tangent at each end removes weld from highly stressed curved section and facilitates alignment. Uniform concentricity permits smaller angles to be obtained by cutting elbow. Available in various wall thicknesses of carbon steel, high yield and low alloy materials. Write for data sheet.

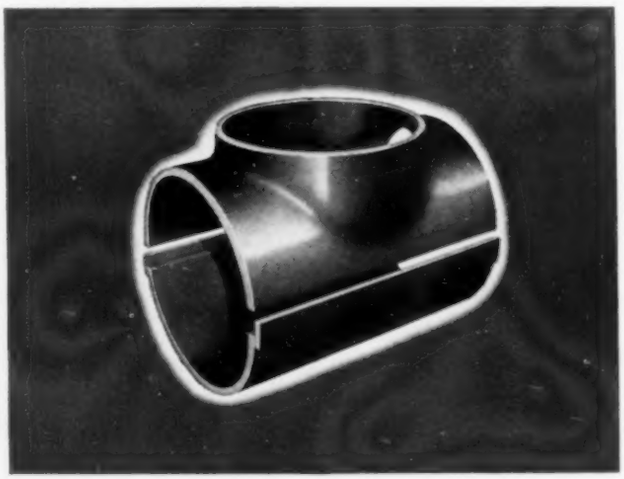


LONG TANGENT ELBOWS

Cost no more than ordinary elbows and are available up to 36" OD in wide variety of materials and wall thicknesses. Tangent at each end equal to ¼ nominal pipe size up to 24" OD—all larger sizes have 6" tangents. These added straight ends save pipe and often eliminate short nipple and extra weld; they remove circumferential welds from point of greatest stress . . . make lining up easier, save time and expense in welding. Write for Catalog 54.

REDUCING ELBOWS

Takes the place of straight elbow and reducer, thus saving one weld, requiring less space and reducing turbulence of flow. Stock sizes available up to 30" OD and in reductions to one-half of large diameter. Being fabricated from plate, it can be made in special thicknesses and materials. Write for data sheets.



WRAP-AROUND SADDLES

"Complete encirclement" type of welded branch reinforcement for making hot taps is available with or without welding strap and from carbon steel or high yield materials. In addition to fitting shown, other types illustrated in Section 8 of ASA B31.1 are available. Write for Data Sheet No. 20.

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Reinforcement for nozzle connection into cap. Available in sizes up to 24" on 36" in carbon steel and high yield materials.

Recognizing the fact that conventional welding fittings do not always best meet pipeline needs, Midwest some years ago began the development of special fittings. These are designed for a specific job . . . to save time, cut cost and improve pipelines. The unique Midwest method of manufacture makes the use of special materials easy, economical and permits better delivery . . . it also often enables us to improvise to exactly meet unusual conditions. Write us regarding your requirements.

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DRILLING GAS MAINS UNDER PRESSURE: Jaeger "125" rotary compressor powers a Mueller C1-36 Drilling Machine, drilling a 10" main under pressure, preparatory to installing line stopper plug. The unfluctuating pressure maintained by the Jaeger rotary insures a uniformly accurate cut, vital for proper seating of the inserted plug.

Jaeger Rotary maintains constant pressure at slower operating speeds

Jaeger compressors produce the same volume of air as other rotaries at 100 to 250 rpm slower engine speeds. Full load speed of a "125" is only 1700 rpm, of a "600", just 1650. This higher Jaeger efficiency saves horsepower, saves fuel, saves engine and compressor wear.

Instantaneous air delivery and smooth, stepless speed modulation enable a Jaeger rotary to maintain 100 lbs. constant pressure under all normal operating demands.

8-hour fuel tanks, full size tool boxes and retractable pneumatic tired dolly wheel are standard on all 2-wheel models. For complete data or demonstration, ask your Jaeger distributor or write for Catalog JCR5.

JAEGER "250" — biggest rotary compressor on two wheels. 4-wheel units to 600 cfm.

THE JAEGER MACHINE COMPANY
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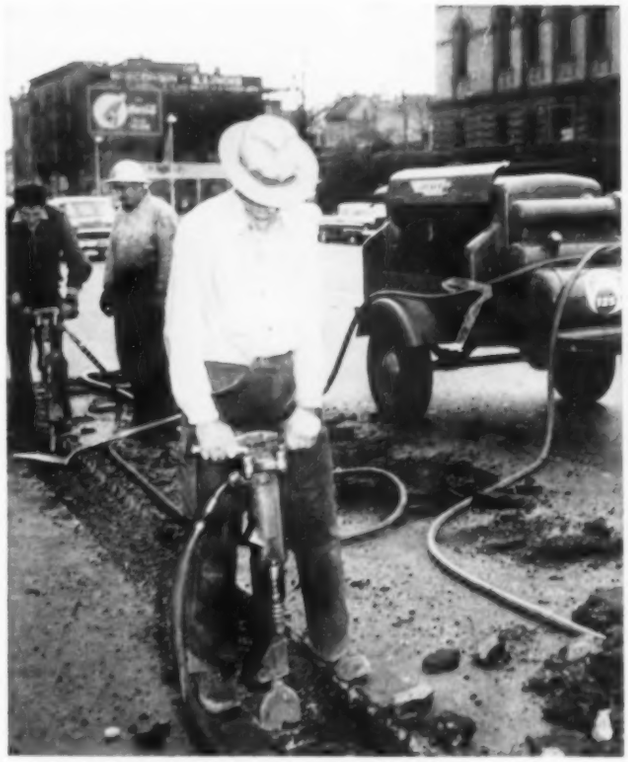
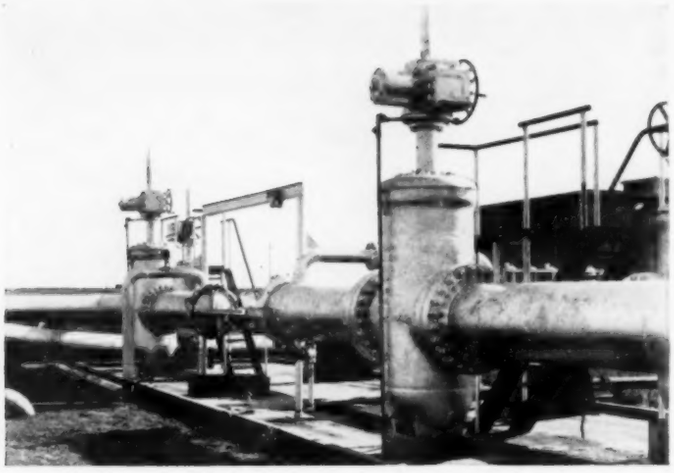
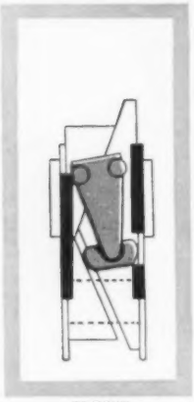
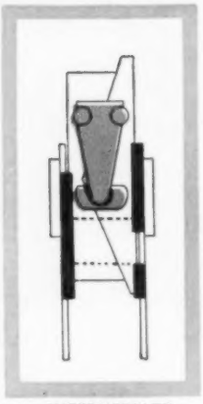


FAST TRENCHING: Jaeger "125" maintains full pressure in two ⇌25 Thor breakers. Speeds trench cutting and other work with power tools.





CLOSED POSITION



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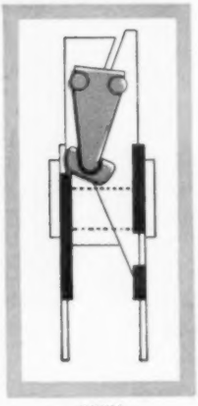
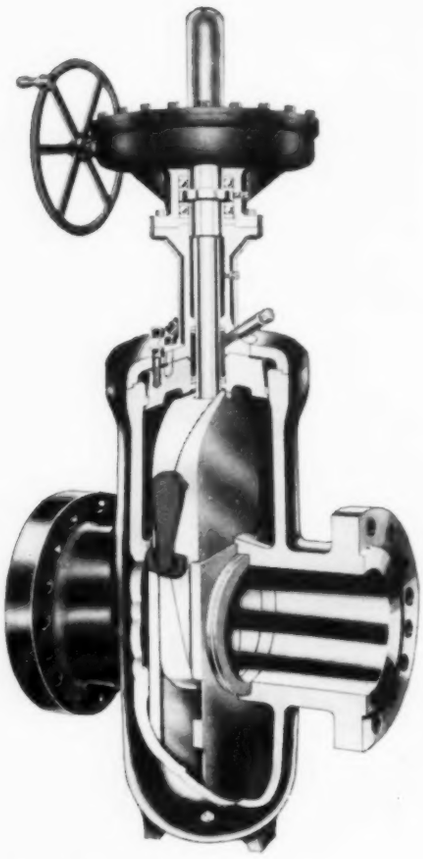


OPEN POSITION



You Get Free and Easy Opening and Closing in

W-K-M LEVERLOCK* GATE VALVES

You never have trouble opening or closing, even the largest W-K-M® Pipeline Valve, against any pressure, in any service condition.

The exclusive centralizing mechanism found only in Leverlock Valves is the answer. This positive-acting mechanical device holds the gate and segment in a collapsed position so there is no tendency to wedge while valve is being opened or closed.

W-K-M Gate Valves give you longer service with less maintenance. They are your best valve investment for all pipeline services—in sizes 2" through 34" (Sizes 6" and larger are Leverlock Valves), ASA 300 lbs. to ASA 900 lbs. Sizes 2" through 12" are available through supply stores.

*TRADEMARK OF acf INDUSTRIES, INCORPORATED.

Other features that make W-K-M Valves leaders in pipeline service—

• Parallel Expanding Gate provides controlled force seating — upstream, downstream. • Through-Conduit assures full volume, free flow with no turbulence — no pressure drop — free passage of scrapers. • Renewable Seats — may be installed while the valve is in the line. • Pressure seal bonnet, seals tighter as pressure increases. • Superfinished stems — Enclosed packing box — seat lubrication.

W-K-M

DIVISION OF acf INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

Write Dept. J-12 for your copy of the new W-K-M ASA Through-Conduit Gate Valve Catalog 300.

MANUFACTURERS OF W-K-M GATE VALVES · acf LUBRICATED PLUG VALVES · KEY-KAST ALLOY STEEL PIPING FITTINGS · KEY RETURN BENDS AND FITTINGS

ONE OF FIVE SEA-CRANE MODELS (12½ to 35 tons), this TC-108 combines 35 tons of lifting capacity with fast cycling, pinpoint spotting.

Link-Belt Speeder Sea-Cranes handle

bigger loads...faster, safer

INCREASED speed, power and safety . . . greater precision . . . longer machine life. These are the bonuses you get with the new Link-Belt Speeder Sea-Crane.

Whether your requirements involve lighters, tenders, platforms or supply craft—off-shore drilling operations just naturally move ahead faster with these dependable, years-ahead machines.

Illustrated here are just a few of the many advanced-design features that are helping to revise existing standards for pedestal-mounted crane performance. Your Link-Belt Speeder distributor can demonstrate many others. Or write Link-Belt Speeder Corporation, Cedar Rapids, Iowa.

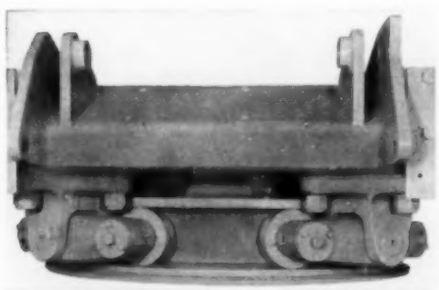
14.629

FINGER-TOUCH PRECISION—With Speed-o-Matic power hydraulic controls, oil under pressure does the work. Response is fast, smooth. No jerk, no jump, no lag.

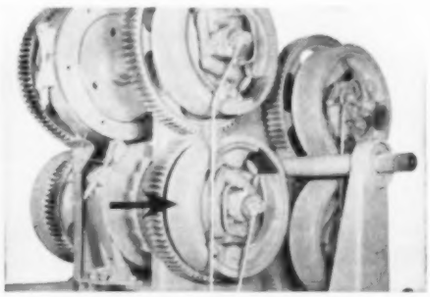
It's time to compare . . . with

LINK-BELT SPEEDER

Builders of a complete line of shovel-cranes . . . with exclusive Speed-o-Matic power hydraulic controls



ADJUSTABLE CONICAL HOOK ROLLERS are furnished in four, six and eight hook roller arrangements depending on loads and conditions.



BOOMHOIST LOWERING CLUTCH on the independent rapid boom hoist provides power up and down—more precise boom control.

ELEVATED CABS are available as an extra to provide added visibility and safety and reduce the number of blind loading operations.

New 350-mile "Oklahoma Extension"

taps new field . . .

A. O. Smith furnished 262 miles of the 26-inch pipe. Photo above shows some of the difficult conditions encountered in putting in the line.

Natural Gas Pipeline Company of America puts line into service in late November of '57

This new line (mainly 26-inch pipe) allows Natural Gas Pipeline to augment existing supplies from their fields in the Texas Panhandle. With the new line, they'll be able to increase reserves up to 127,000,000 cubic feet per day from new fields in Jack and Wise Counties, Texas.

The Oklahoma Extension will tie in with the Company's mainline at a point near Fritch, northeast of Amarillo. It represents better than a 10% addition to their present pipeline network that includes 1400 miles for affiliate Texas-Illinois Natural Gas Pipeline Company and 1700 miles for Natural Gas Pipeline Company.

262 miles — of 26-inch pipe was furnished by A. O. Smith. In fact Natural Gas Pipeline Company and A. O. Smith have enjoyed a long and mutually satisfactory association. Over 1000 miles of the 30-inch pipe for the previously mentioned Texas-Illinois line was also supplied by A. O. Smith.

For almost 30 years . . . A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is in nearly every important high-pressure line.

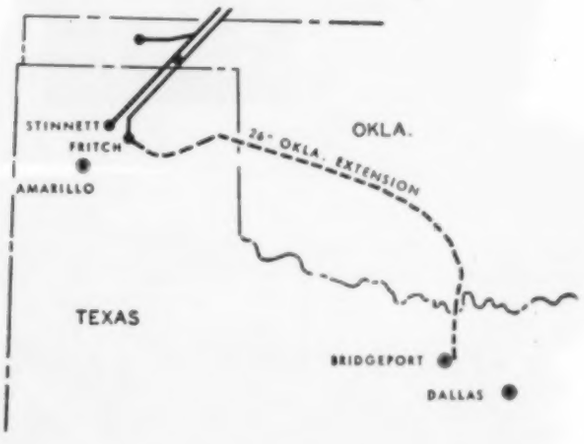
Through research A.O. Smith *. . . a better way*

A.O.Smith
CORPORATION
TUBULAR PRODUCTS DIVISION
Milwaukee 1, Wisconsin

Chicago 4 • Dallas 35 • Houston 2 • Los Angeles 17 • Midland 5, Texas • New Orleans 12 • New York 17 • Tulsa 3 • A. O. Smith International S. A., Milwaukee 1, Wisconsin, U. S. A.

...expands reserves

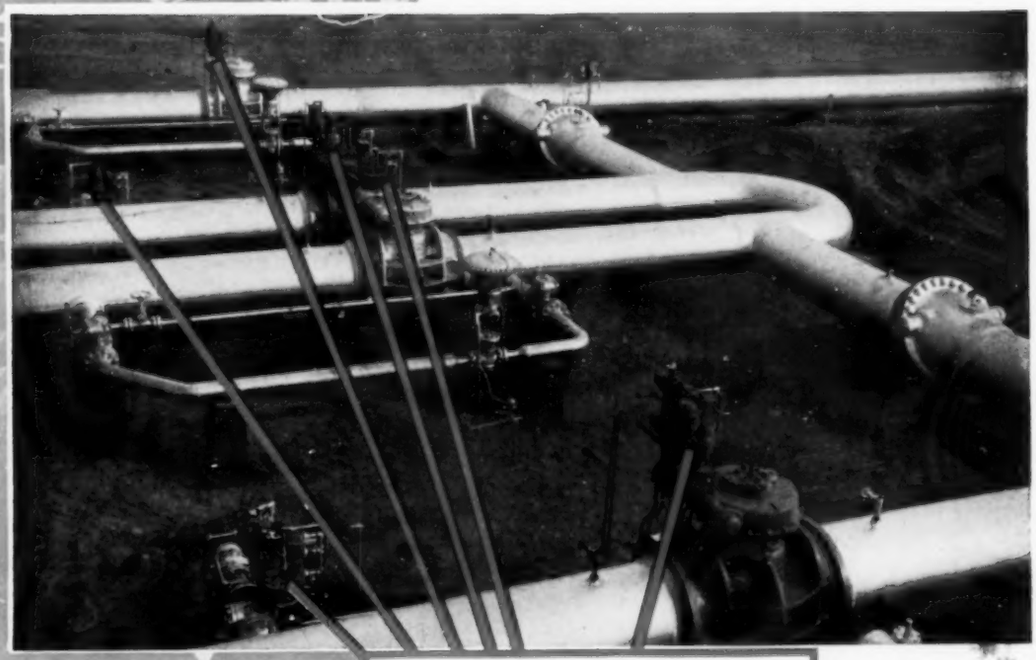
Construction of the Oklahoma Extension, a four-month project, included erection of suspension bridges to carry the pipe over severely eroded terrain and a number of soil-conserving, erosion-control dams.



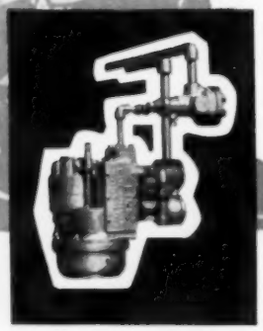
The 350-mile line extends from newly tapped fields in Jack and Wise Counties in Texas and swings north into Oklahoma and then back into the Panhandle to tie in with the Company's existing mainline near Fritch, Texas.

For more data on advertised products, use Readers' Service Cards, last page.

THE E.I.M. FIREMEN



All E.I.M. Installations of This Type Conform With "Emergency Shutdown Facilities" (No. 843.431 Section 8, ASA B31.18-1955)



EVERYWHERE AND ANY TIME THERE'S A FIRE EMERGENCY— YOU'LL FIND THE G-2 CONTROLLING THE SITUATION

EIM G-2 valve controls guide the flow of gas through compressers where the pressure is increased.

With a breach in the line there comes a marked reduction in pressure which, within a matter of seconds, automatically closes the G-2 valve control and re-routes the gas through an undamaged line. In addition to this, a vent valve in the affected area is opened sending a jet of gas from the damaged line spewing harmlessly into the air, thus reducing fire losses to a minimum.

G-2 valve controls stand watch twenty-four hours a day in silent protection of life, limb, property, and our valuable natural resources.

E-I-M Company INCORPORATED

1340 OLD SPANISH TRAIL
HOUSTON 25, TEXAS • MOhawk 4-4587

Valve Controls • Speed Reducers
Cooling Tower Drives • Control Valves

Remote supervision of Pipeline Booster Stations

. . . . with Pulse Beat telemetering!

REMOTE PUMP CONTROL • REMOTE VALVE CONTROL • TANK LEVELS
PRESSURE • TEMPERATURE • FLOWS

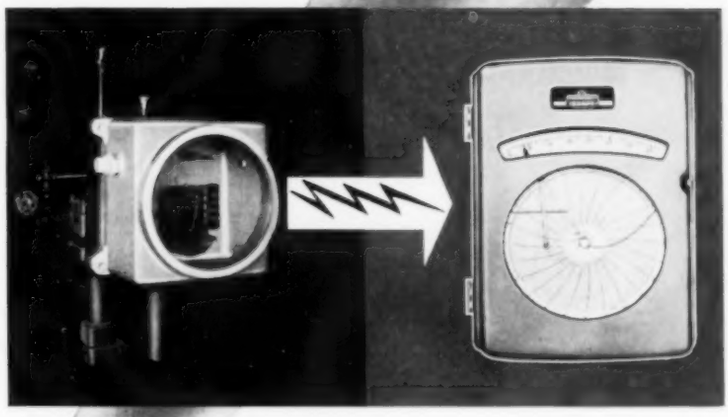
Get more accurate, more dependable report-back and read-out data . . . more economically . . . with Builders Chronoflo telemetering.

As part of a supervisory control system . . .

- **it is inherently suitable for integration into data reduction and tone transmission systems.**
- **it adapts readily to electrical transmission media in general.**

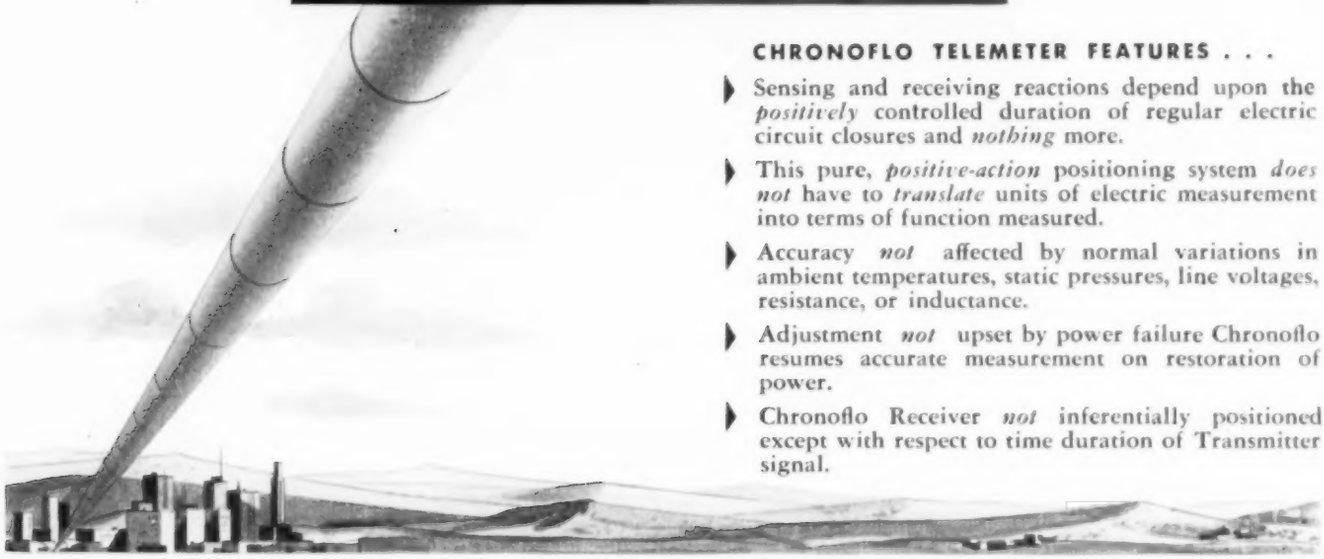
Act today! Request Bulletin 230-H4A for complete data. Let Builders application engineers help with your metering-control problems.

Write **Builders-Providence, Inc., (an associate of Proportioneers, Inc.) 545 Harris Avenue, Providence 1, Rhode Island.**



CHRONOFLO TELEMETER FEATURES . . .

- Sensing and receiving reactions depend upon the *positively* controlled duration of regular electric circuit closures and *nothing* more.
- This pure, *positive-action* positioning system *does not* have to *translate* units of electric measurement into terms of function measured.
- Accuracy *not* affected by normal variations in ambient temperatures, static pressures, line voltages, resistance, or inductance.
- Adjustment *not* upset by power failure Chronoflo resumes accurate measurement on restoration of power.
- Chronoflo Receiver *not* inferentially positioned except with respect to time duration of Transmitter signal.



BUILDERS-PROVIDENCE
DIVISION OF
B-I-F INDUSTRIES
METERS FEEDERS CONTROLS

Double blocking with one valve and no blind

How Phillips Pipeline gets double valving control at single valve cost

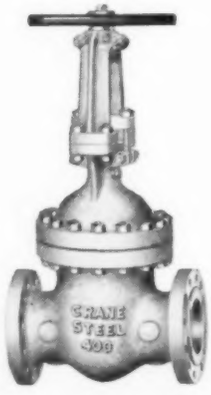
Phillips Pipeline Co. has this benefit at all 25 pump stations on its Texas-to-Illinois products line. The manifold at its Stinnett Station, shown above, is typical.

Here is the economical solution for holding two dissimilar products with a single valve, without any mixing. The valves are Crane 400-pound steel gates, modified with a flexible wedge disc, and equipped with a bleeder valve at bottom of the body.

When a cross-over line valve is closed, depending on product being pumped, pressure on upstream side of disc may be up to 500 psi. On the downstream side, it may reach 1100 psi. Yet with the bleeder valve open to atmosphere, there is *no leakage past the disc* and *no product contamination.*

Each of these Crane valves does the work of the usual two. Installation costs are halved. Station personnel work better and faster with half as many valves to operate.

This Crane valve principle is ideal for pipeline, dehydrator or refinery—wherever double blocking is practiced. Ask your Crane Representative for full information, or write to address below.



CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

Tubing stretch mill, Youngstown, Ohio. Electronically controlled mill to be completed during second quarter of 1958 . . . will provide increased production for Tubing comparable to our increased capacity for Casing. Both Upset Finishing Mill and this facility will greatly augment our existing No. 1 and No. 2 Seamless Mills in Youngstown. Photo shows mill building under construction.

NEW MILLS FOR BIGGER MARKETS

Two years ago, ground was broken for our three new seamless Pipe facilities. The express purpose of this massive expansion program was to make YOUNGSTOWN'S production capacity and seamless pipe product mix conform to the future needs of the Oil and Gas Industries. These seamless pipe facilities are now integrated with your demands. This means you can look to YOUNGSTOWN for a full line of Oil Country Tubular Goods without limitations as to size, grade or finish in Drill Pipe, Casing, Tubing and Line Pipe!

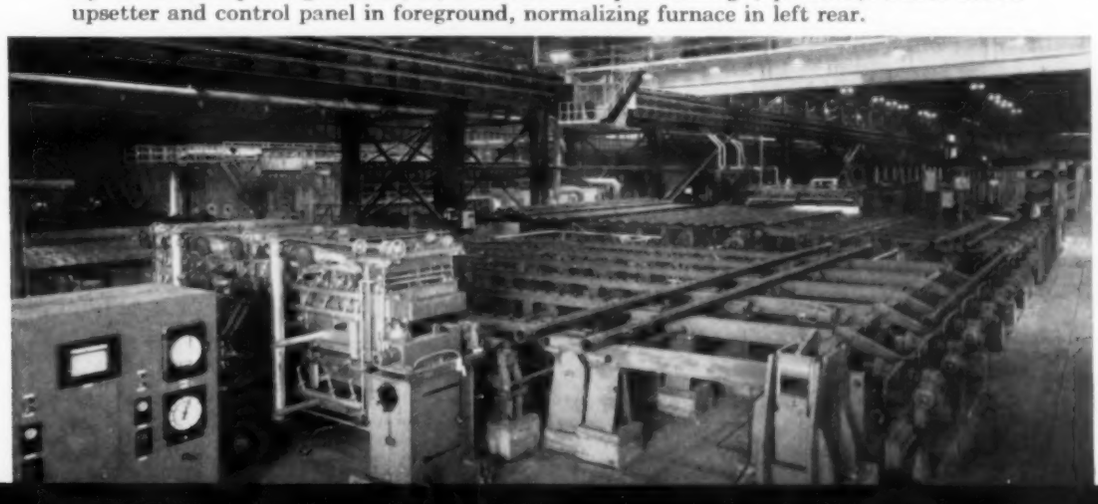
QUALITY YOUNGSTOWN SERVICE

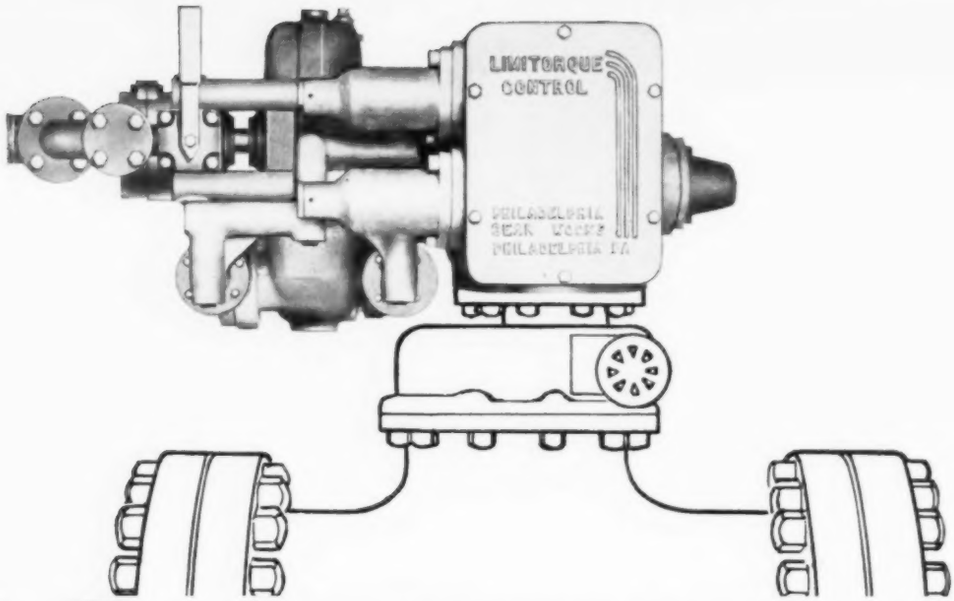
YOUNGSTOWN
SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steels
Youngstown, Ohio

No. 3 seamless mill, Indiana Harbor, Indiana. Fully automated, ultra modern mill . . . began operating September 30. Contains world's largest Rotary Billet Heating Furnace . . . adds to our over-all capacity in both alloy and carbon casing. Offers API casing in sizes 4½", 5", 5½" and 7", in grades H-40, J-55, N-80, in ranges 2 and 3 . . . plus line pipe in sizes 4½", 5 9/16" and 6 5/8" O.D. in grades A, B, X-42, A106, A53 in single and double random lengths. Photo shows Rotary Furnace in foreground.

Upset finishing mill, Youngstown, Ohio. Also a fully automated mill began operations September 15. Contains a pair of automatic upsetters with attendant furnaces plus a full-length normalizing furnace for highest quality control of all products. This mill adds to our capacity for Drill Pipe in grades D, E, x-95 and in Upset Casing (Speedtite). Photo shows upsetter and control panel in foreground, normalizing furnace in left rear.

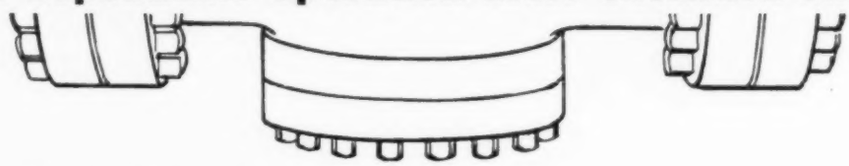




LimiTorque TYPE "GAS" VALVE CONTROLS

...feature the only true turbine design available

...provide dependable operation after extended shutdown



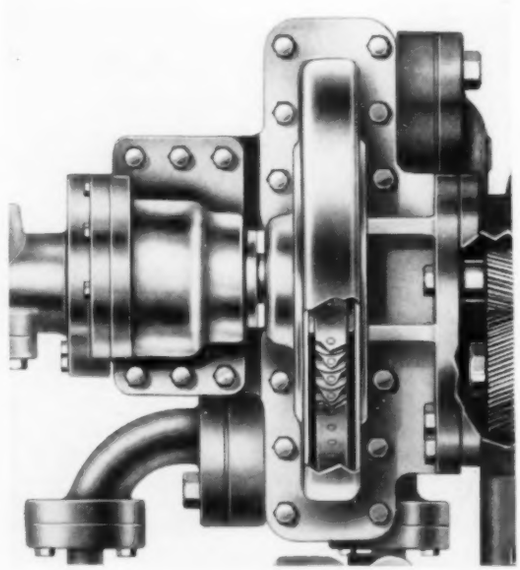
exclusive design features include:

- **Positive, simple overspeed control**
- **All internal parts of non-corrosive materials**

The type GAS valve operator introduces an entirely new concept into automatic mechanical valve operation. Here is a motorized operator for plug and gate valves especially designed for natural gas pipeline service. The single wheel turbine develops high torque at rated speeds and is designed to operate on natural gas at unreduced inlet pressures up to 1200 psi. The gas turbine eliminates serious friction wear at vane tips and possibility of damage due to excessive motor speeds. Being a true turbine, with permanently lubricated bearings, no line oiler or any other lubrication means is required.

In some sizes of gate valves the LimiTorque type GAS operator is top mounted, eliminating the expense of valve bevel gearing. A declutching mechanism disconnects the motor, allowing a complete checkout of the entire system. The turbine can be run without moving the valve or disturbing limit valve settings.

All operators are readily adjustable to packaged automatic shutdown systems, solenoid control and manual control through the use of four way valves. Electrical switches can be provided for remote light indication.



Cutaway shows unique single wheel turbine construction.

LimiTorque®

PHILADELPHIA GEAR WORKS, INC.
ERIE AVE. & G STREET. PHILADELPHIA 34, PENNA.
Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS

Limitorque Corporation • Philadelphia

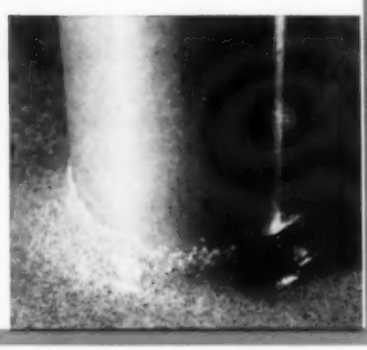
In this "Sohio" tank farm, evaporation loss has been sharply reduced by the use of a layer of "Microballoon" spheres. Capacity of the farm is 400 thousand bbls., four tanks operating on approximately a 7-day cycle with 7 RVP oil. The fifth tank handles 4 to 5 RVP oil on a 23-25-day cycle. Pipeline rate is 40 thousand bbls. per day.

How "Microballoon" Spheres Cut Evaporation

Laboratory beaker shows how "Microballoon" spheres form a blanket on oil surface, sealing it effectively against evaporation loss.

Convenient method of installation is to pump the "Microballoon" spheres into tank along with oil, using an aspirator similar to those for foam fire-fighting systems.

Blanket of "Microballoon" spheres covers surface completely around walls and internal supports in the tank as the oil level rises and falls.



Evaporation loss cut 79% for three years

WITH "MICROBALLOON"* SPHERES

Here's a successful case history on evaporation control that has saved many thousands of dollars over three years. The annual evaporation loss was sharply cut from 13,700 barrels to only 2,700 barrels for five cone-roofed tanks. And this money-saving installation paid for itself in a matter of months!

Approximately 22,000 pounds of "Microballoon" spheres were installed in five cone-roofed tanks at the Salem, Illinois, station of the Sohio Pipeline Company. After three years, this same installation is still cutting evaporation loss *without additional investment!*

Experience has shown that "Microballoon" spheres are non-abrading, won't harm tanks, pipes, or pumping equipment. For further information, write Bakelite Company, Dept. AY-168.

*Registered trade-mark of The Standard Oil Co. (Ohio)

For evaporation control...

BAKELITE BRAND

RESINS

UNION CARBIDE

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

The terms BAKELITE and UNION CARBIDE are registered trade-marks of UCC.

ELECTRIC-RESISTANCE-WELDED
LINE PIPE BY J&L

J&L line pipe made by the electric resistance welding process is a quality product. It is particularly desirable, economical and efficient because of uniform wall thickness, roundness, weldability, ductility, and availability in long lengths.

Uniform wall and roundness make for fast lining up.

Long lengths minimize field welds and cut construction costs.

Weldability is excellent, and the pipe bends readily to any desired course.

Offered in sizes 5-9/16″ through 12-3/4″ from the J&L mill at Aliquippa, Pa.

Ask any J&L Supply man for further details.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN STEEL

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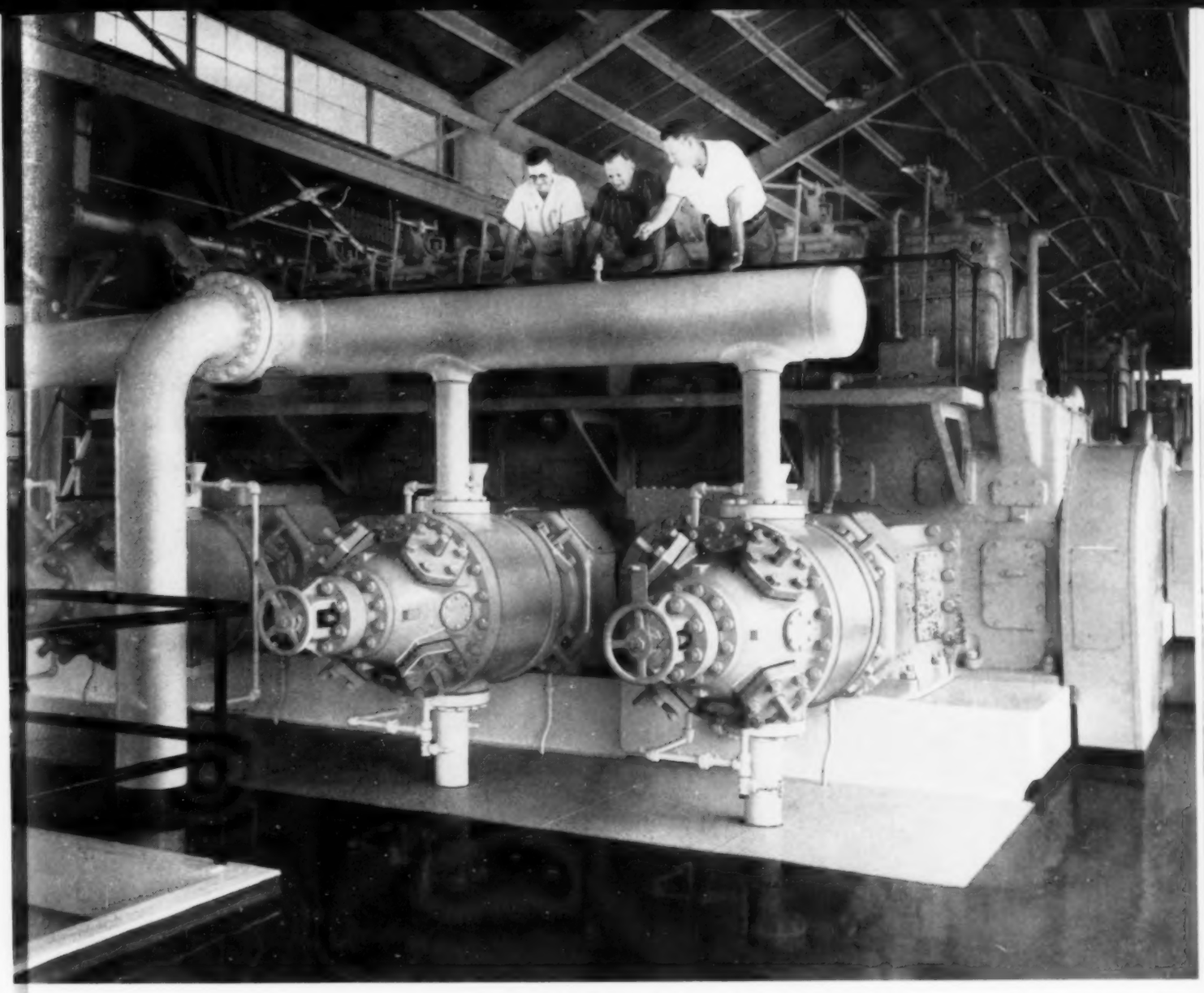


Richard N. Rogers, Results Engineer (left), W. C. Drienhofer, Station Superintendent, and R. A Cuyler, Jr., Gulf Sales Engineer, inspect one of the 31 units lubricated by Gulf Security since 1944

At Tennessee Gas Transmission Company's Middleton Station . . .

Not a ring change in 26,800 hours with

GULF SECURITY OIL

Thirty-one gas engine compressor units have been running smoothly at the Middleton Station with Gulf Security Oil since 1944. The records show 26,800 hours operation without a single ring change. And after 85,000 hours, Security in the crankcase was still in excellent condition.

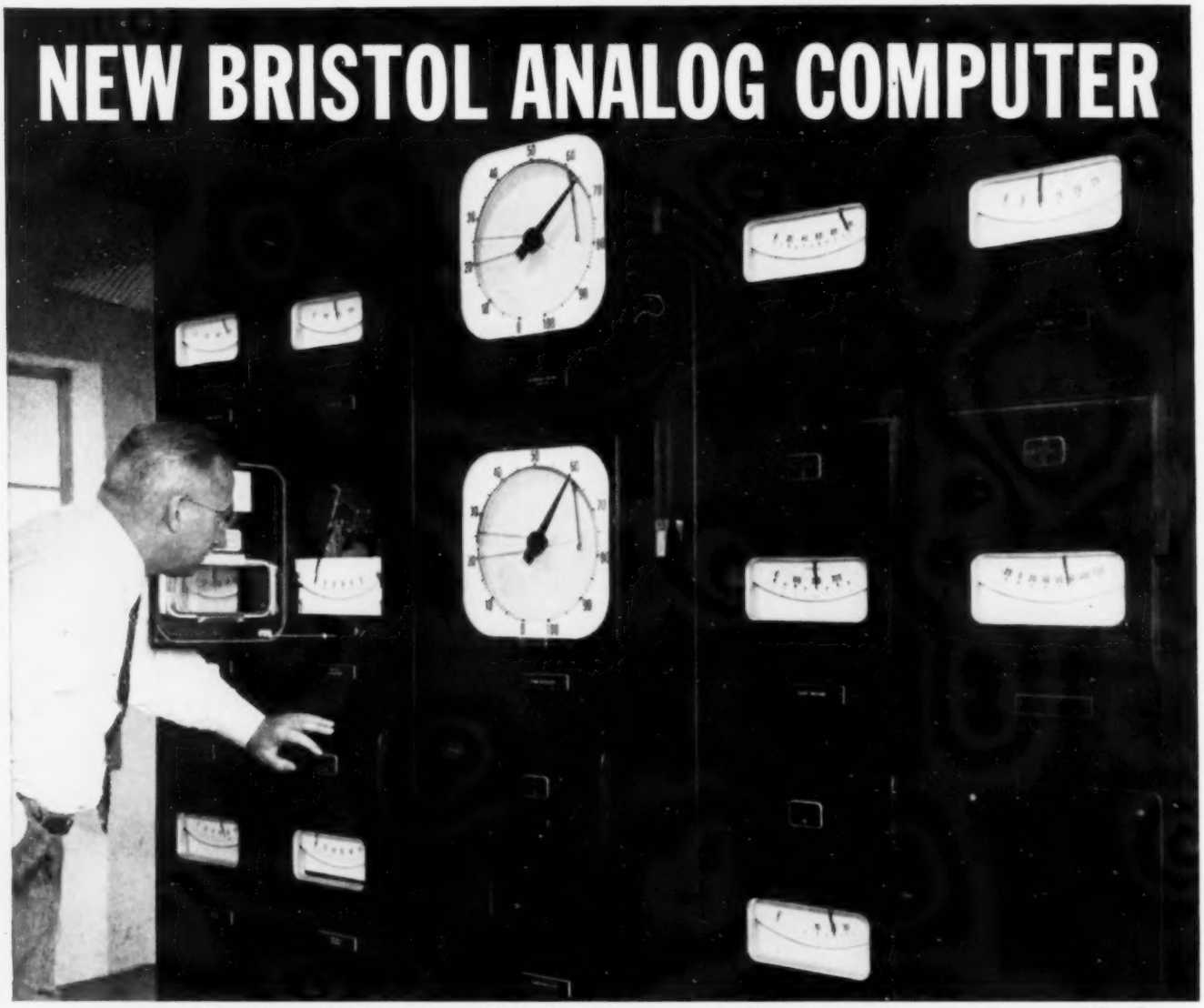
Here for 13 years Gulf Security has lived up to its name—security against operating troubles and high maintenance costs. Gas engine compressor units lubricated with Gulf Security are consistently free of heavy port and ring belt deposits. Wear is negligible—in fact, ring and liner life in both power and compressor cylinders is well above average. Bearings last longer, too.

When you use a Gulf product you get an extra dividend—the free services of an experienced Gulf engineer. He's always "on call" to assist you with any problem involving lubricants, fuels, or any other petroleum product. He can help you find opportunities to cut costs. Write, wire or phone your nearest Gulf office.

GULF ®

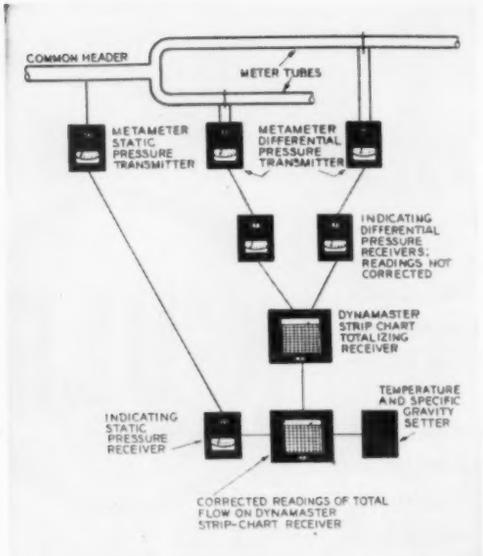
GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

NEW BRISTOL ANALOG COMPUTER



BRISTOL COMPUTING TELEMETER EQUIPMENT in metering station, Public Service Electric and Gas Company of New Jersey.

Variables entered automatically and continuously by telemetry


COMMON HEADER
METER TUBES
METAMETER STATIC PRESSURE TRANSMITTER
METAMETER DIFFERENTIAL PRESSURE TRANSMITTER
INDICATING DIFFERENTIAL PRESSURE RECEIVERS; READINGS NOT CORRECTED
DYNAMASTER STRIP CHART TOTALIZING RECEIVER
TEMPERATURE AND SPECIFIC GRAVITY SETTER
INDICATING STATIC PRESSURE RECEIVER
CORRECTED READINGS OF TOTAL FLOW ON DYNAMASTER STRIP-CHART RECEIVER

SIMPLIFIED SCHEMATIC of new Bristol computing telemeter system. Actual instruments can be miles apart.

Totalize flow through any number of pipelines . . . **Compute and apply corrections** for static pressure, temperature, specific gravity, supercompressability, as required. Various basic orifice flow factors can be electrically inserted into the electronic computing circuit by switch selection . . . **Indicate, record, or read out corrected flow** (or any other variables) at centralized or remote stations.

This outstanding Bristol development is already in use on natural gas and steam distribution systems by the country's largest utilities and distribution companies, including Public Service Electric and Gas Company of New Jersey, Consolidated Edison Co. of New York, United Gas Improvement Co. of Philadelphia, Central Hudson Gas & Electric Corporation, and others.

It supplies complete, accurate, continuous information to the gas dispatcher. With data both on trends in gas load and cumulative total consumption at his fingertips, the dispatcher can operate closer than ever before to contracted load limits, while still avoiding high penalty rates. *In most cases, the instrument-computed totals come within 0.4 to 1% of billing meter totals.*

Find out how this latest Bristol development can step up efficiency and cut cost on your distribution or transmission system. The new computer is adaptable to distribution of any gas or liquid, including: artificial and natural gas, water, oil, gasoline, steam, air, solutions of various kinds, ammonia, brine, etc. Write to: The Bristol Company, 114 Bristol Road, Waterbury 20, Conn.

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BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Fig. 3466 Horizontal Triplex Plunger Pump. Maximum speed, 250 RPM. Maximum capacities and pressures: 91 barrels per hour at 1180 PSI; 179 barrels per hour at 600 PSI. Write for 1958 catalog.

THAT'S WHY WE'VE ADOPTED THEM AS STANDARD

We experimented a long time—and found, when the returns were in, that we got more of what we want in Gaso Pumps. More in adaptability to various conditions. More in day-in and day-out dependable performance. More in operating and maintenance economy, and more in service life. That, in a nutshell, is why we wrote GASO into our standard pump specifications, and why we consider the policy a short cut to the results we want in pumping service.

DISTRIBUTORS

W. L. SOMNER COMPANY, Shreveport, Louisana • Odessa, Texas • Tinsley, Mississippi • Brookhaven, Mississippi
POWER PUMPS, INC., Long Beach, California • Farmington, New Mexico
PEDDLERS, INC., Houston, Texas
PUMP ENGINEERING CO., Wichita Falls, Texas
LUFKIN FOUNDRY & MACHINE CO., Casper, Wyoming
HAGUE EQUIPMENT CO., INC., Evansville, Indiana
LUFKIN MACHINE CO., LTD., Edmonton, Alberta

GASO PUMP & BURNER MFG. CO.
TULSA, OKLAHOMA
Export Office: 149 BROADWAY, NEW YORK

GASO PUMPS
for every oil industry need

for live power,
strength scaled to BIG JOBS,
matchless service ease . . .

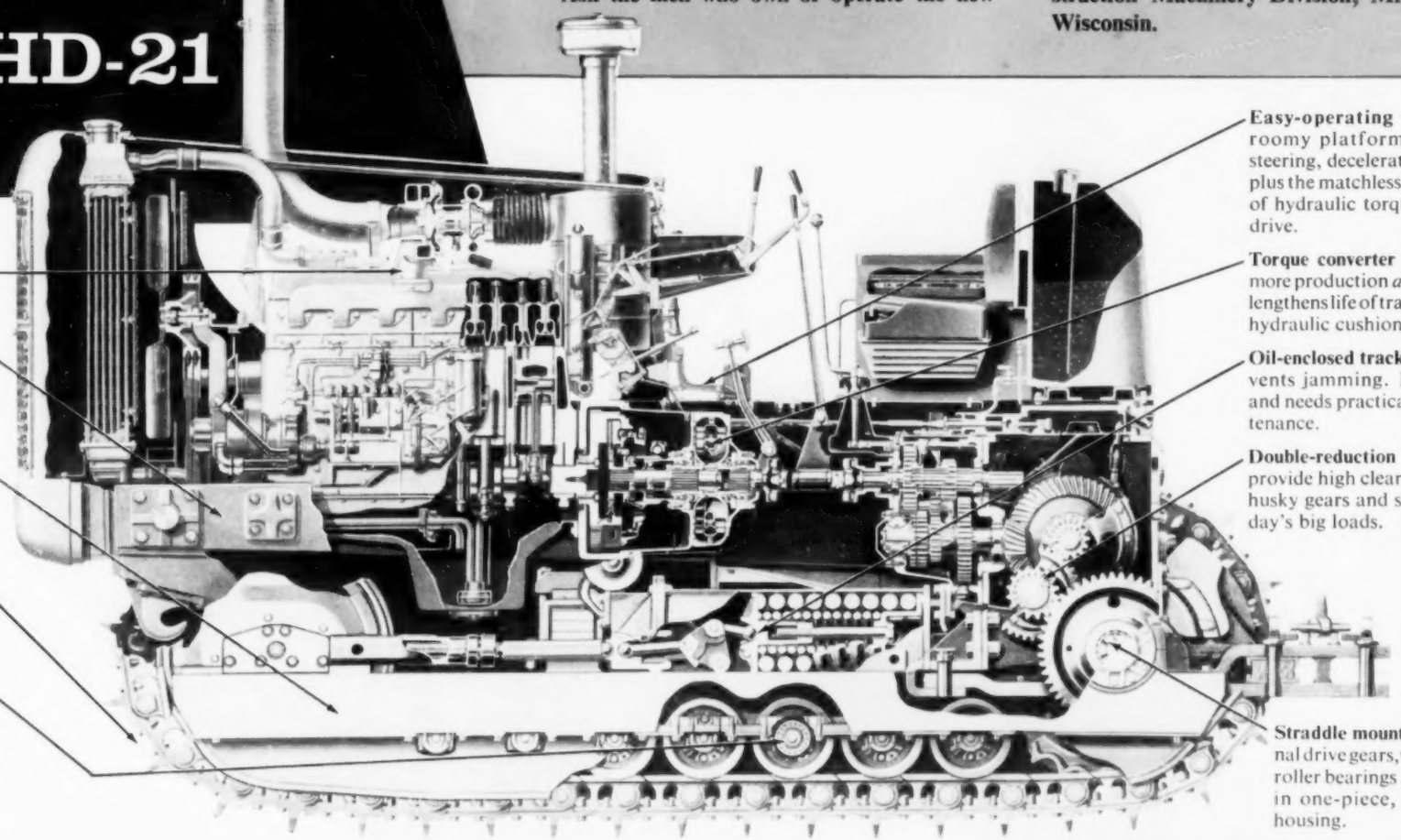
you owe yourself
a close-up look at the

NEW HD-21

This is live power! Allis-Chalmers' new turbo-engine delivers 225 net usable horsepower. Hydraulic torque converter drive puts this power to work—automatically provides the right pull or push for every load, at the maximum travel speed for existing conditions. New, longer track provides outstanding traction, flotation and balance.

Ask the men who own or operate the new high-production HD-21. On jobs that really put a tractor to the test, they all like the responsive way it handles, the way it moves into the dirt fast and keeps moving in toughest going.

The Allis-Chalmers HD-21 offers you more working tractor ability—dollar for dollar—than any other big crawler tractor you can buy. Just compare and you'll agree! Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.



New turbo-engine brings extra power, cleaner operation, new fuel economy and longer life.

Unit construction with Box-A Main Frame design lets you remove major components without disturbing adjacent assemblies.

Cost-cutting alignment—special high-strength steel truck frames keep tracks, idlers, rollers and sprockets riding true for longer life.

Tough track—true-dimension machining and heat treating insure outstanding wearability under severe job conditions.

Easy-rolling, easily maintained truck wheels—with Positive Seals and tapered roller bearings, the HD-21's truck wheels, idlers and support rollers ride freely to deliver more usable horsepower . . . need greasing only once every 1,000 hours.

Easy-operating with clean, roomy platform, hydraulic steering, decelerator pedal . . . plus the matchless convenience of hydraulic torque converter drive.

Torque converter drive means more production *automatically*, lengthens life of tractor through hydraulic cushioning.

Oil-enclosed track release prevents jamming. It's reliable and needs practically no maintenance.

Double-reduction final drives provide high clearance, permit husky gears and shafts for today's big loads.

Straddle mounting of all final drive gears, with tapered roller bearings . . . mounted in one-piece, line-bored housing.

Your Allis-Chalmers dealer will be glad to demonstrate the 21's live-power performance . . . and to prove it can help you on your big jobs.

ALLIS-CHALMERS

Engineering in Action

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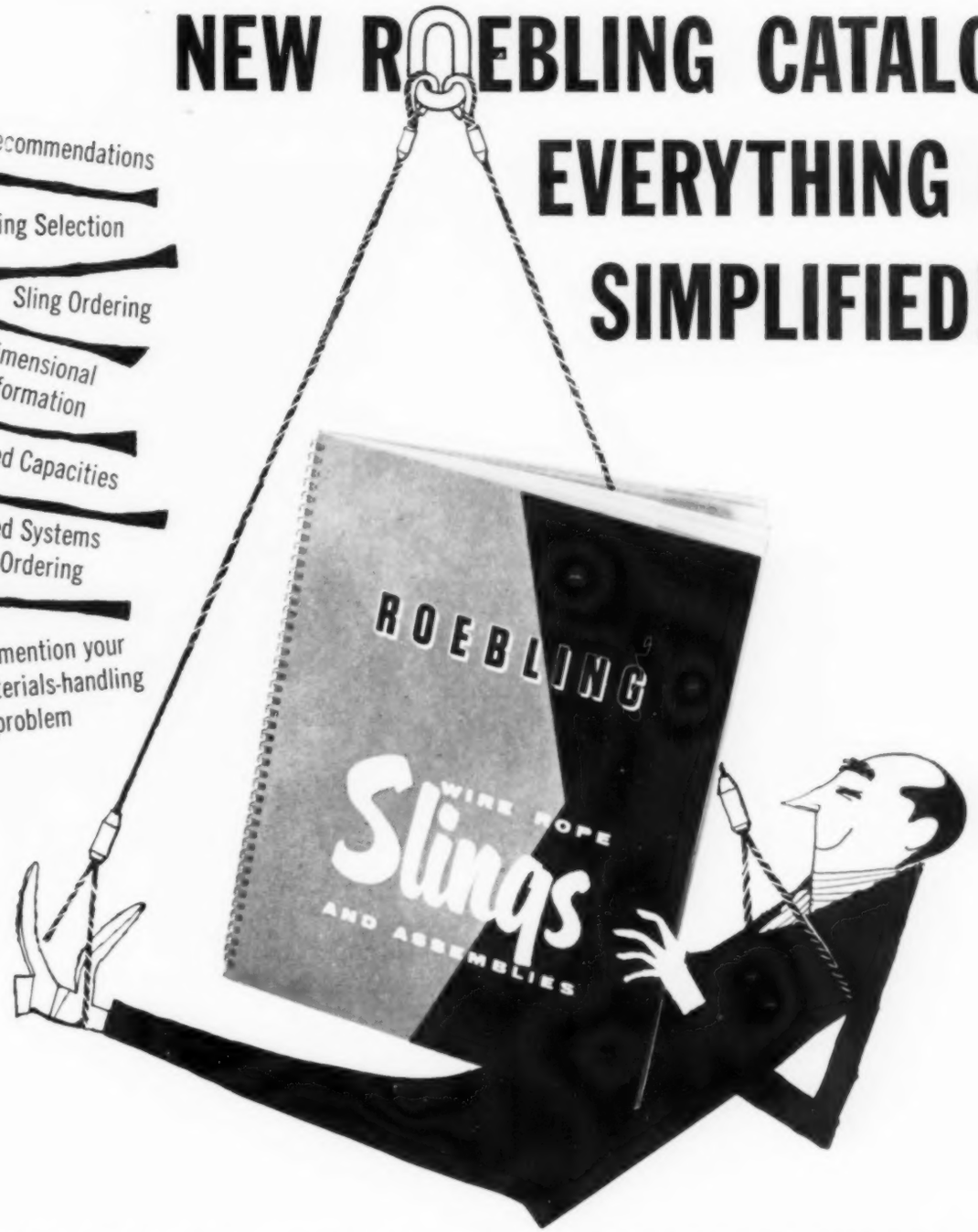

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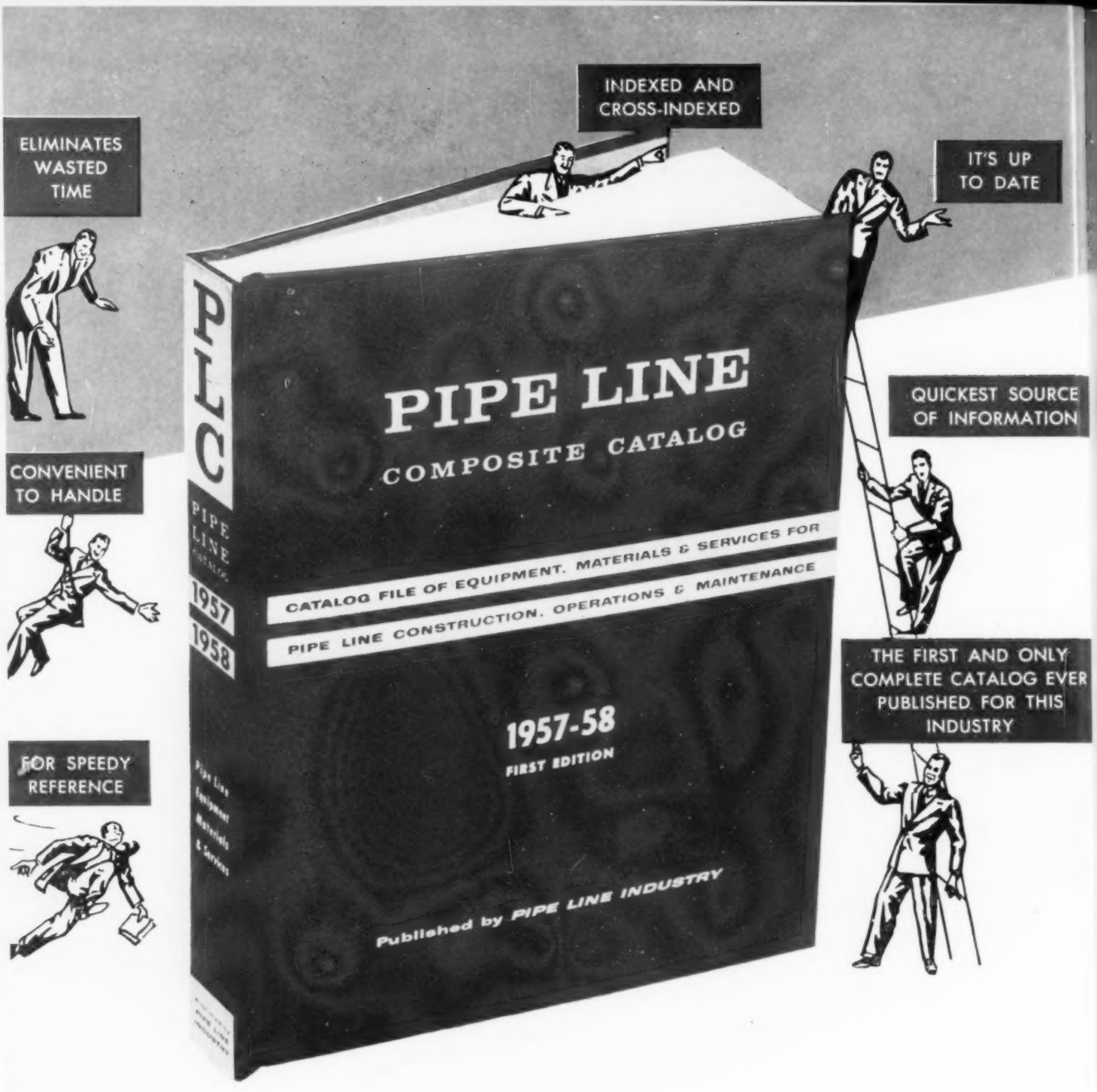

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PIPE LINE COMPOSITE CATALOG

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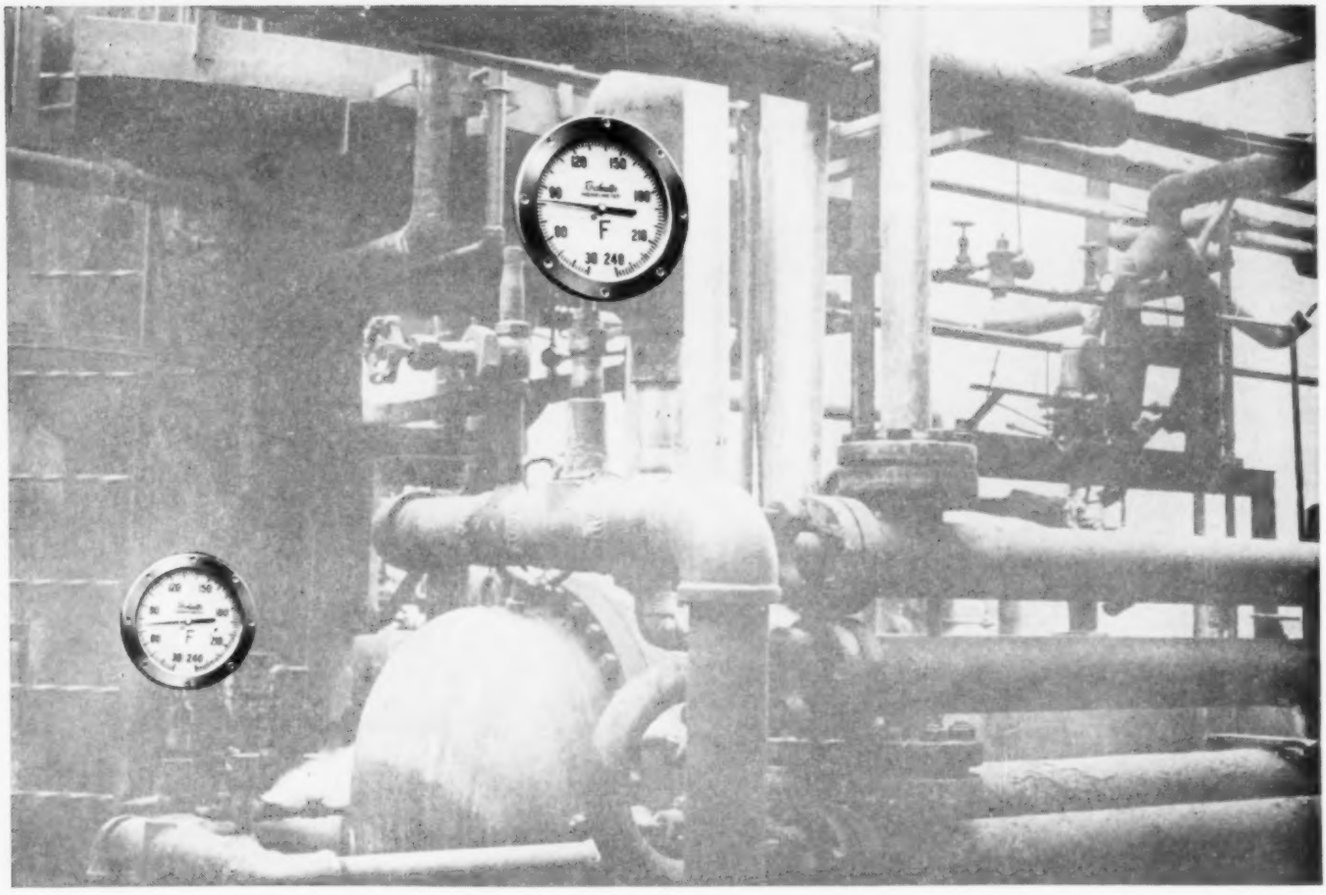

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Before *you* buy pipe wrap, compare—not just weight but fiber content as well. Carey No. 15 Asbestos Pipeline Felt assures you better protection, better performance, from the coatings you use.

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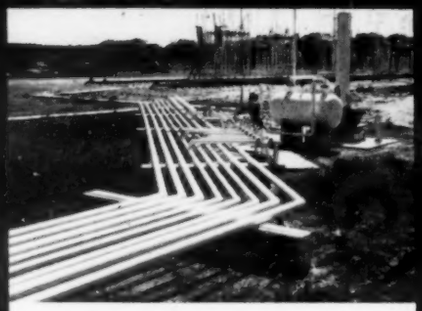
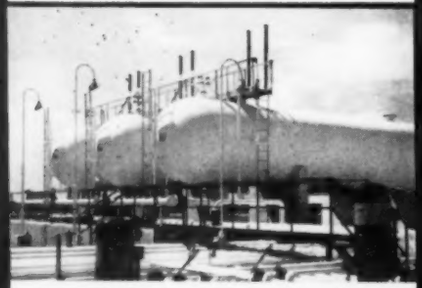


Copon pipe coatings provide thicker films per coat for extra protection of seams, welds, sharp edges and other trouble spots.



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PIPE LINE PANORAMA

New Trend: Pipe Line Service to Airports . . . Costly, time-consuming method of delivering aviation fuel to airports via tank trucks is running into stiff competition from pipe lines. (See Page 60.) By end of '57, at least 21 air force bases will be served by pipe lines. Commercial airports now served by lines include Moissant, New Orleans; San Francisco International; Amon Carter, Fort Worth; Lambert Field, St. Louis. Line is being completed at new Love Field terminal in Dallas.

Lines carry fuel from refinery or terminal directly to plane loading gate. One major deterrent to complete conversion: All fields may not be able to guarantee use of facilities long enough to retire pipe line investment.

Coal to Step Up Pipe Line Attack . . . Look for renewed coal industry support of Staggers Bill, or similar amendment, during next session of Congress. Bill would subject direct natural gas sales by pipe line companies to FPC control and prohibit below-cost sales of natural gas to industrial users. When introduced last June, coal-sponsored bill was defeated in committee, 20 to 6.

Now There Is Talk of "Divorcement" . . . Justice Department's antitrust head, Victor R. Hansen, says another probe may follow present Elkins Act investigation of pipe lines. (See November PIPE LINE INDUSTRY.) Next step would involve all-out study of the competitive effects of pipe line ownership by refineries and major companies. Out of study would come decision as to whether pipe lines should be completely "divorced" from these operations.

APIers Discuss New Metering Developments . . . Recent improvements in positive-displacement metering on products lines have greatly increased industry acceptance of this measuring technique. New developments include: Improved means of meter proving and transmission of meter registration to consoles in control rooms, plus continuous correction provisions.

One company has measured 60 million barrels at $6 per million barrels maintenance cost. Predictions are for .01 percent accuracy in future measurements with new meters and proving techniques.

Pipe Line Mileage to Set New Record . . . Committee for Oil Pipe Lines predicts 4840 miles of major lines will be constructed in '57. Cost: $240 million. Total includes 2157 miles of crude and 2683 miles of products lines. Also, 1903 miles of crude and natural gas lines will be converted to products service.

This compares with '56 total of 2750 miles of new lines (Cost: $105 million)—and 1232 miles of conversions from crude to products.

New Rolling Mill for Southwest . . . Old tin-smelter site in Texas City is the new home of Texas Rolling Mills. The company's first plant, which began operation last month, is producing 6000 feet of 16-36 inch electric weld pipe per day for natural gas industry. Another, larger plant will be built on same site in '58.

Glycol for Natural Gas Dehydration

Efficient gas dehydration prevents hydrates, maintains high pipe line efficiency, and reduces internal corrosion.

By K. Gene Mitchell
Black, Sivalls and Bryson
Oklahoma City

DEHYDRATOR EFFICIENCY is dependent on a number of factors. Of prime importance is the efficiency of the desiccant. In dehydration of natural gas, liquid desiccants have found the widest acceptance. Of the materials available diethylene and triethylene glycol have in general proved the most practical for this service.

Dehydration of natural gas must be considered for several reasons.

- Prevention of hydrates which eventually results in plugging the line and stopping the flow of gas.
- Prevents formation of liquid water which will reduce pipe line efficiency.
- Reduces internal corrosion. Carbon dioxide which is usually present in the gas will dissolve in the water forming a corrosive acid solution.

Hydrate Inhibition Most Important. Removal of water from natural gas to prevent hydrate formation is the primary purpose of most dehydration units. Hydrates are formed above the freezing point of water, collecting in fittings, valves, regulators etc., and restricting or stopping the flow of gas. The temperature at which hydrates form in natural gas systems depends on the pressure and the composition of the gas. Katz[1] has published a correlation from which the hydrate forming temperature can be predicted if the gas gravity and pressure is known. Figure 1 shows the hydrate temperature for gas of different gravities at pressures up to 4000 psi. This curve shows that the temperature at which hydrates form increases with an increase in specific gravity. For example, pure methane at 600 psi will form hydrates at approximately 40°F., while 0.65 gravity gas at 600 psi forms hydrates at about 56°F. The effect of pressure on hydrate formation is also apparent. Gas with a gravity of 0.6 at 200 psi forms hydrates at 37°F., while the same gas at 1500 psi will form hydrates at about 66°F., or considerably above the freezing point of water. Some deviation from the hydrate temperatures indicated by these curves will be experienced in actual operation because of variations in gas composition.

No Hydrates Below Dew Point. It is theoretically possible for hydrates to form when only water vapor is present in the gas, but this has not been observed in actual practice. Liquid water is usually considered necessary for hydrate formation. Dehydration of the gas below the dew point, as determined by operating conditions of the line, will eliminate any possibility of moisture condensation.

Water content of natural gas is usually shown on a chart as a function of temperature for various pressures. (Figure 2). The water content is shown in pounds of water vapor per million standard cubic feet of gas for different temperatures and pressures. For example at or above the dew point, gas at 1000 psi and 100°F. will have a water content of about 60 pounds per million standard cubic feet of gas. Effect of pressure on water content is readily seen from the chart. Gas at 200 psi and 100° F. will have a water content of about 245 pounds per million or four times the water vapor contained when the gas is at 1000 psi. The change in water content with temperature is also evident. At 1000 psi, gas that had a water content of 60 pounds at 100° F. will only have 13 pounds of water vapor at 50° F. The remaining 48 pounds of water vapor condenses when the stream is cooled from 100° F. to 50° F.

Liquid Desiccants Used. Several liquid desiccants have been used for dehydration of gases. Among these are glycerine, sulfuric acid, calcium chloride brine, lithium chloride, diethylene glycol and triethylene glycol. Glycerine was formerly used in drying manufactured gas, but never gained wide usage due to high cost, low dewpoint depressions and operating difficulties. Calcium chloride brines have been used in both batch type pots and continuous regenerative type plants, but operational problems and corrosion have limited the usage. Lithium chloride gives good dewpoint depressions but equipment necessary for its usage is complex and the substance is expensive, thus economics have limited its application. The corrosion problems involved with the sulfuric acid eliminate its usage although it at one time was used extensively for dehydration in chemical plants.

Glycols Most Practical. This leaves diethylene and triethylene glycol, both of which are used in the natural gas industry. In general, both meet the prerequisites for a good liquid desiccant. The properties desirable in a liquid desiccant are:

- Easy to regenerate.
- Low vapor pressure.
- High water absorption capacity.
- Low viscosity.
- Stability, both chemical and thermal.
- Non-toxic.
- Non-corrosive.
- Low heat of solution and absorption.

Diethylene glycol has been used in natural gas dehydration plants for over 25 years. Several plants were installed between 1938 and 1940. Triethylene glycol has been used about eight or 10 years in gas dehydration plants. Today there are more glycol type dehydration units in operation than any other kind. They have a wide range of operating conditions; capacities from one to over 500,000 mcf of gas per day; temperatures from

35° F. to over 130° F.; operating pressures as high as 2000 psi have been reported.

Properties Necessary. The following discussion covers the properties of glycols or any liquid desiccants that affect their application to dehydration.

Figure 3 is a graph of the specific gravity of diethylene and triethylene glycol. Although triethylene glycol is slightly heavier the difference is very small and has no effect on the performance of one over the other as a dehydration medium. Both are slightly heavier than water which means any hydrocarbon liquids that might get into the system will float on the glycol.

Specific heat curves for diethylene and triethylene glycol are similar as shown in Figure 4. Average for the two liquids is approximately the same. The heat load required for triethylene glycol regeneration is slightly higher than for diethylene glycol since triethylene is regenerated at higher temperatures. Also, triethylene absorbs more water which results in a larger vaporizing and reflux load in the triethylene glycol regeneration reboiler and still.

Viscosity Limits Efficiency. Viscosities of glycol-solutions are shown on Fig. 5. Triethylene has a higher viscosity than diethylene, which should affect the contact efficiency in the absorber. Concentrations obtained in actual practice for regenerated triethylene glycol are slightly higher which more than cancel the viscosity effect on the tray. Under the same conditions, a triethylene glycol tray will absorb more water than diethylene. Below 40° F., the viscosity of both ethylene and diethylene becomes high enough to affect tray operating efficiency. At temperatures ordinarily encountered in dehydration plants (65° F. to 100° F.), the viscosity does not affect the tray operation significantly. This is evidenced by tray efficiencies of 70 percent.

Viscosities shown are for atmospheric pressure. Higher pressures encountered under actual operating conditions increase the glycol viscosity. For example, the viscosity of diethylene glycol at 100 psi is approximately four times the value shown on the curve. Tray efficiency is reduced but

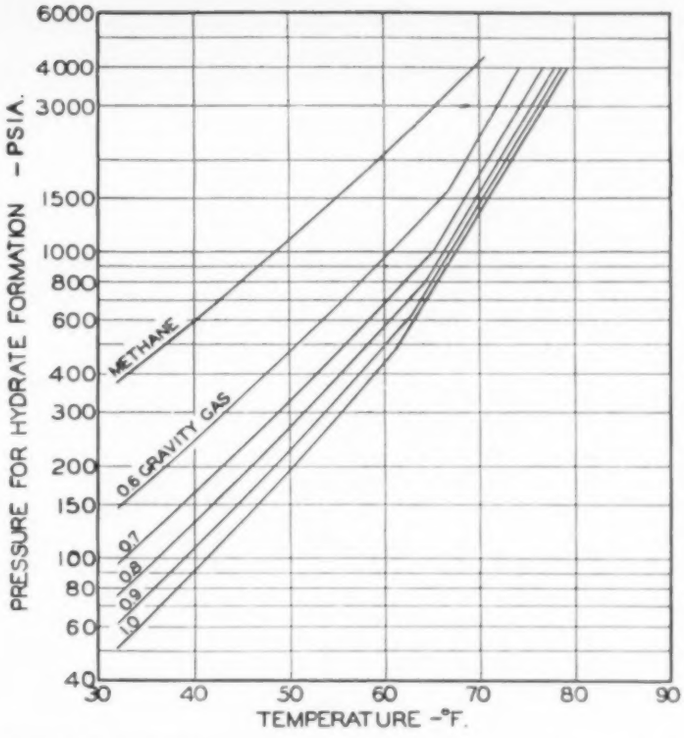

FIGURE 1—Minimum temperatures and corresponding pressures at which a given gas may be cooled without hydrate formation. (Dr. Donald F. Katz, Technical Paper No. 1748, AIMME.)

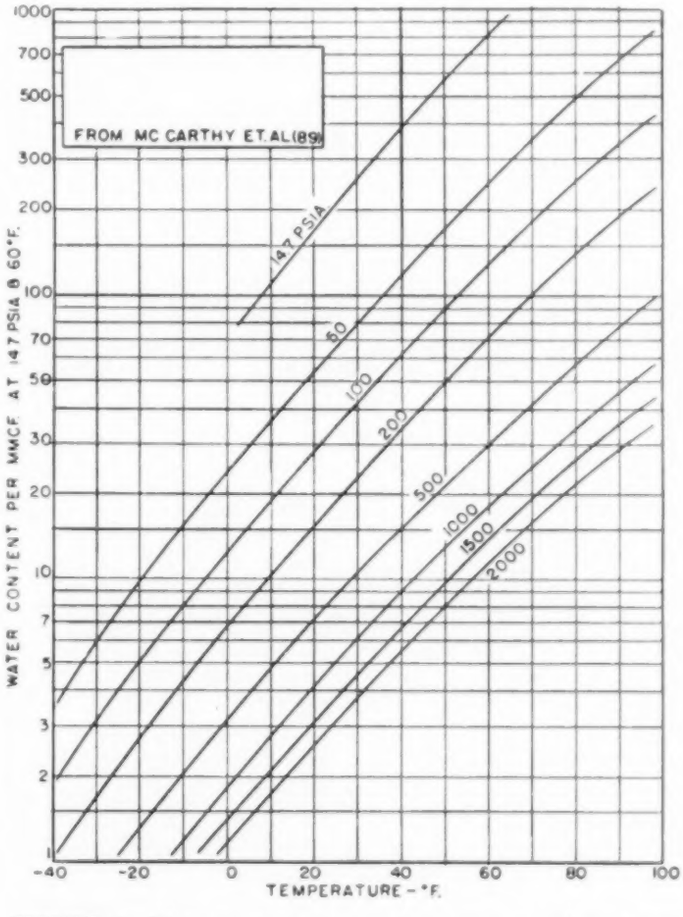

FIGURE 2—Water content of natural gas as a function of temperature for various pressures. Effect of pressure on water content is readily seen from the chart.

Lower vapor pressure of triethylene glycol means regeneration equipment can be less complicated for triethylene than for diethylene glycol without increasing vapor losses.

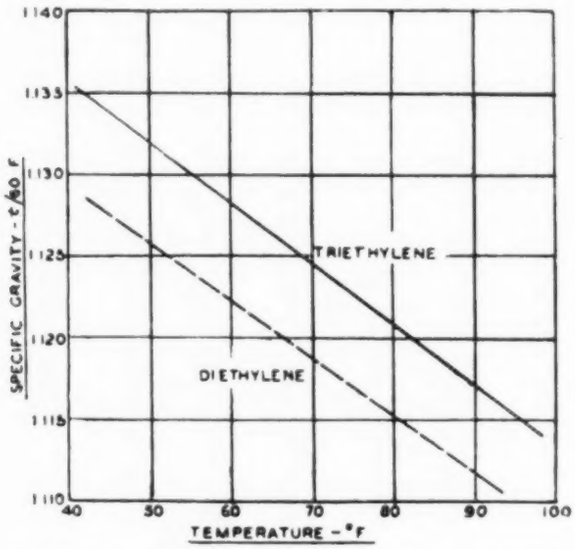

FIGURE 3—Specific gravity of diethylene and triethylene glycol. Although triethylene glycol is slightly heavier, the difference has no effect on performance. Both are heavier than water.

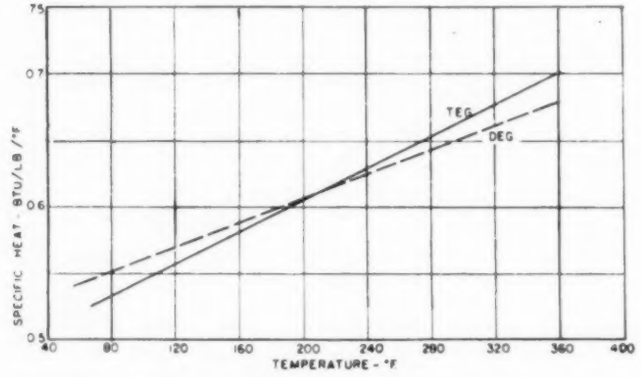

FIGURE 4—Specific heat of diethylene and triethylene glycol. Average is approximately the same with the two curves crossing at 200°F.

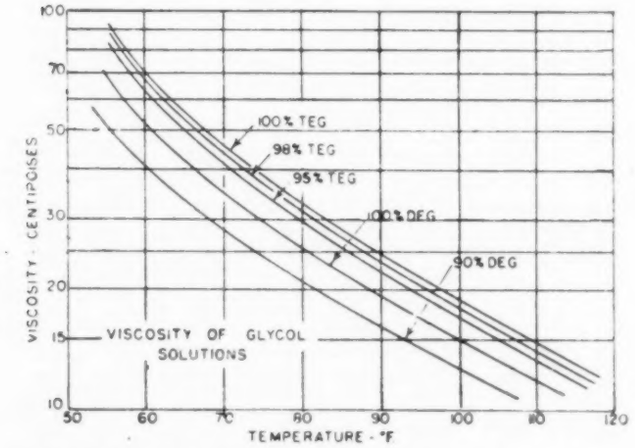

FIGURE 5—Viscosities of glycol solutions at atmospheric pressure. Higher pressures encountered under actual operating conditions increase the viscosity, which decreases dehydrator tray efficiency.

this can be overcome by increased glycol circulation rate.

High Temperature Decomposes Glycols. Relative boiling points of triethylene and diethylene glycol solutions are shown in Figure 6. In dehydration plants where decomposition of the glycols is important, higher concentrations of triethylene glycol can be obtained. The reported initial decomposition temperature for diethylene glycol is 328° F. which would allow 95 percent lean glycol to be obtained. Triethylene glycol has a reported decomposition temperature of 404° F. which means a lean solution concentration of 97.5 percent. Air or oxygen will increase the decomposition rate. Oxygen is generally not present in the regeneration equipment of natural gas dehydration units and these decomposition points do not specifically apply. However, regeneration equipment should not be operated much in excess of these temperatures.

Effect of Vapor Pressure. Figure 7 gives the vapor pressures of diethylene and triethylene glycol. The vapor pressure of triethylene glycol is considerably lower than that for diethylene glycol. At 80° F. it is about one-fifth of vapor pressure for diethylene glycol, which means a considerable reduction in equilibrium vapor losses in the absorber. Also, the lower vapor pressure of triethylene glycol means regeneration of the glycol or removal of the water vapor is much easier. Thus the regeneration equipment can be less complicated for triethylene than for diethylene glycol without increasing glycol vapor losses. The regeneration unit for glycol plants is generally an atmospheric reboiler. An air cooled reflux section on the still furnishes sufficient reflux to virtually eliminate glycol losses through the still overhead line.

In actual operation, glycol concentrations of 98.5 percent triethylene glycol are obtained with standard regeneration equipment while glycol losses in the still overhead are practically nil.

One of the principal reasons for the widespread usage of triethylene glycol for natural gas dehydration is its lower vapor pressure, which lowers

equilibrium vapor losses in the absorber. Ease of regeneration also makes triethylene glycol more desirable as a dehydrating medium. However, the cost of diethylene glycol is lower than triethylene and in some cases, economic considerations indicate its usage even though theoretical vapor losses are higher.

Effect of Decomposition. Previously degradation or decomposition of glycols was mentioned. Early published data of Gallaugher and Hibbert[2] indicated thermal decomposition for diethylene glycol at 328° F. and 404° F. for triethylene glycol in the absence of air. A more recent and thorough investigation of decomposition of glycol has been reported by Polderman.[3] In these tests diethylene and triethylene glycol were heated at higher than normal operating temperatures. Also, the attack on carbon steel was measured. The following conclusions were reached as a result of these tests.

1. Thermal abuse of glycols does not necessarily cause the formation of an acidic condition in the glycol solutions. (This is based on the absence of oxygen and hydrogen sulfide). In the absence of air, carbon steel was attacked at the rate of 0.0001 inches per year when exposed to triethylene glycol at 500° F. This is about one-tenth the rate for the same conditions with air being present.
2. Light and heavy degradation products are present in overheated glycols. Substances which affect color are more prevalent in triethylene glycol.
3. The majority of the thermal decomposition products appear to be gases that will leave the solution in the still or absorber sections of the plant.

It was noted that the normal operating conditions of glycol regeneration equipment (320° F. to 330° F. for diethylene and 350° F. to 375° F. for triethylene) will not result in very rapid deterioration of glycol or attack on carbon steel vessels in the absence of air. However, it was pointed out that the presence of even small amounts of oxygen could result in an increased corrosion rate.

Dewpoint Drop Shows Efficiency. Lowering of the water dewpoint is a measure of the effectiveness of a dehydration unit. Dewpoint depression to be obtained from a glycol dehydration unit depends on several factors.

1. Contact temperature on the top trays of the absorber.
2. Glycol circulation rate.
3. Lean glycol concentration.
4. Contact efficiency obtained in the absorber.

The temperature existing at the final contact on the top tray limits the dewpoint depression. The maximum dewpoint depression cannot be greater than the value calculated from equilibrium data for the temperature on the top tray. The contact temperature is not controlled in the average installation.

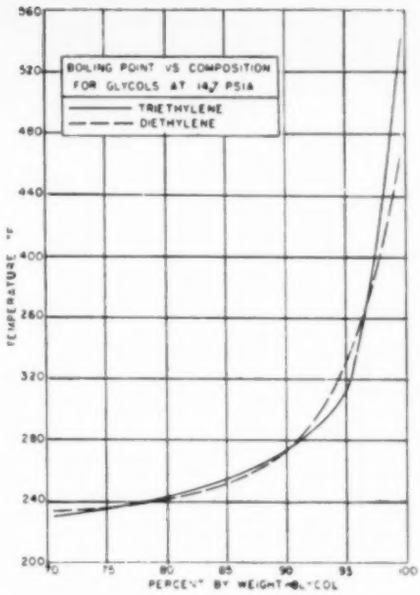

FIGURE 6—Relative boiling points of triethylene and diethylene glycol. Decomposition of glycols at high temperatures is important factor in dehydrator design and operation.

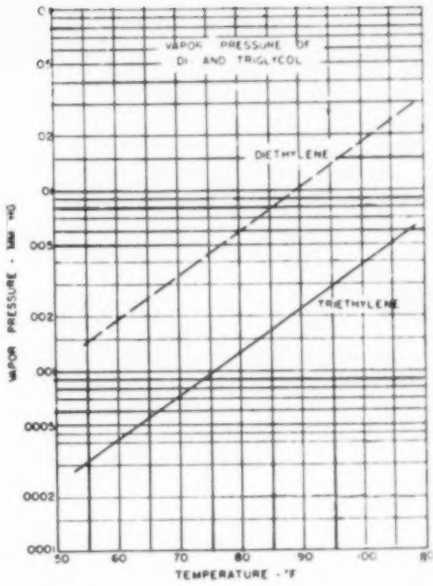

FIGURE 7—Vapor pressures of diethylene and triethylene glycol at various temperatures. The lower vapor pressure of triethylene is one of the principal reasons for its widespread use for natural gas dehydration.

Contact Efficiency. The contact efficiency obtained in the absorber depends on the design of the trays. In general, as mentioned before, tray efficiencies in the order of 70 percent appeared to be obtained in most units. The fact that tray efficiencies are somewhat less than 100 percent is overcome by adding additional trays. In general four bubble trays are used in standard dehydration absorbers. A

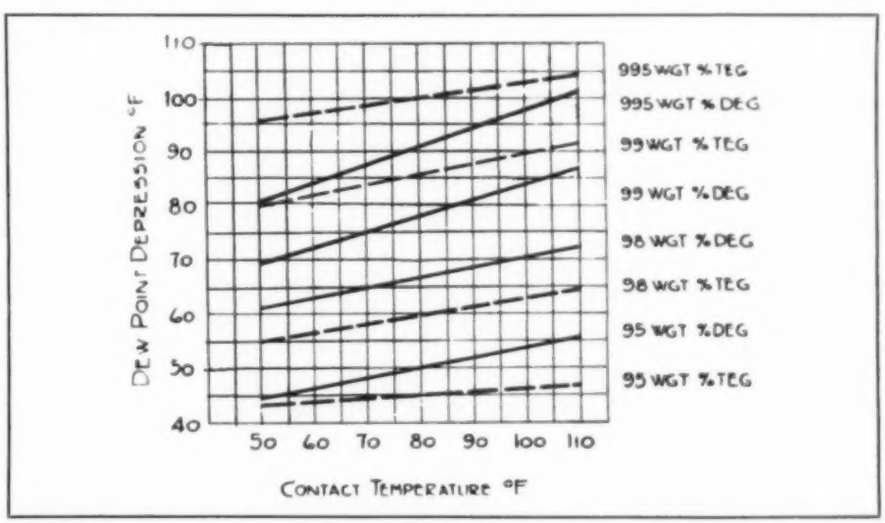

FIGURE 8—Dewpoint depressions that can be obtained from various concentrations of glycol at different contact temperatures. Triethylene glycol concentrations above 98.5 percent have been reported.

Glycol units have considerable application to the average dehydration problems.

larger or small number of trays may be used depending on the dehydration job to be obtained.

The glycol circulation rate is another factor in dehydrator performance. Generally three gallons of glycol are circulated for every pound of water vapor to be removed from the gas. Circulation rates above this have been used and will help increase the dewpoint depression obtained somewhat. However, for average applications, higher circulation rates are not necessary.

Water Concentration a Factor. The remaining factor that influences the dewpoint depression obtained is the water concentration in the lean glycol being pumped into the absorber. Data published by Polderman shows the effect of glycol strength on dewpoint depressions.[4] Figure 8 shows the dewpoint depressions that could be obtained from various concentrations of glycol at different contact temperatures.

Triethylene glycol concentrations above 98.5 percent have been reported from operating units. Figure 8 indicates dewpoint depressions in the 65 to 75° F. range are obtainable from field units. Dewpoint checks indicate this to be true. Higher concentrations can be obtained through vacuum distillation in the regenerator cycle. Diethylene glycol plants using vacuum distillation to obtain a high degree of regeneration without excessive thermal abuse, have reported dewpoint depressions in excess of 100° F. Instances of standard units using either diethylene or triethylene glycol giving 90 to 100° F. dewpoint depressions have been reported.

Contact Efficiency Controls. Standard triethylene glycol units are usually guaranteed to give a 65° F. dewpoint depression based on inlet gas temperature. Dewpoints below 0° F. are not usually guaranteed regardless of contact temperature. At contact temperatures below 65° F. the viscosity of the glycol becomes an important factor in contact efficiency obtained on the trays. At contact temperature in the 30 to 40° F. range the viscosity becomes high enough to effect the flow of the glycol on the trays and through the equipment, especially on low pressure applications. Pure diethylene glycol freezes or becomes a mushy mixture of crystals and liquid at about 16° F., while triethylene glycol freezes at about 24° F. The effect of viscosity greatly reduces the efficiency of the absorbers so that for contact temperatures of 40° F. a dewpoint depression of more than 40° F. is difficult to obtain. Dewpoints below 0° F. have been reported for standard glycol units, but the usual guarantee is 0° F. minimum dewpoint.

Contact temperatures above 100° F. are not recommended because of the increased vapor loss in the absorber. Glycol losses several times the 0.1 gallon per million guaranteed for units operating below 100° F. have been reported on hot wells flowing at 130° F. to 140° F.

Units guaranteed to produce 75° F. and up to 90° F. can be obtained by giving special attention to operating conditions in the design.

In general, glycol units have considerable application to the average dehydration problems. As long as extremely low or high gas contact temperatures are not involved, the glycol unit will give more than adequate dewpoint depression for line protection without excessive glycol loss.

About The Author

K. Gene Mitchell, project supervisor in the Development group, Oilfield Equipment division of Black, Sivalls and Bryson, Inc., has worked almost entirely in the field of gas conditioning, particularly along the lines of dehydration. He graduated from the University of Oklahoma in 1952 with a B.S. degree in chemical engineering. While attending OU, Mitchell served as president of the student branch of the AIChE and, as a student, achieved the highest scholastic record possible for an engineer. Shortly after graduation he joined Black, Sivalls and Bryson.

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1. Katz, D. L., "Prediction of Conditions for Hydrate Formation in Natural Gases," Pet. Eng., Ref. Annual, V16, No. 10, 223 (1945).
2. Gallaugher, A. F. and Hibbert; Journal of the American Chemical Society, Vol. 59 (1937) page 2524.
3. Polderman, L. D., "Glycol Degradation in Gas Dehydration Service," P24, Proc. Gas Cond. Conf., Univ. of Okla. Mar. 16-17, 1954).
4. Polderman, L. D., "Equilibrium Dewpoints in Natural Gas-Glycol Systems," Proc. Gas Cond. Conf., Univ. of Okla. (Mar. 29, 1955).

William G. Dudley Named Gulf Publishing President

WILLIAM G. DUDLEY has been elected president of The Gulf Publishing Company. He succeeds his father, Ray L. Dudley, who died October 29.

A graduate of the Houston public school system, William Dudley was one of the youngest navigators in the Air Force's Pacific operations during World War II. He received his Bachelor of Arts degree in chemical engineering from The Rice Institute in 1949 and Master of Science in chemistry from The University of Texas in 1951.

William G. Dudley

After graduation he worked with the research staff of Dow Chemical Company, Freeport, Texas. Starting as a research engineer, he was a group leader when he resigned to join the editorial staff of PETROLEUM REFINER, a Gulf Publishing magazine, in 1953.

For the past four years Dudley has worked in various departments of the company, including advertising and market research. He was a vice president of the company at the time of his election as president.

Mrs. Ray L. Dudley was elected a vice president of the company.

Near the highest point on the Southern Pacific products line, construction crews encountered solid granite at Donner Summit. In spite of the terrain, line-up and stringer bead crews made good progress. Over 20 percent of the welds made in the mountain sections of the line were X-rayed. Route of the line skirted Donner Lake in the distance.

SP's New Line Conquers Rugged Sierras

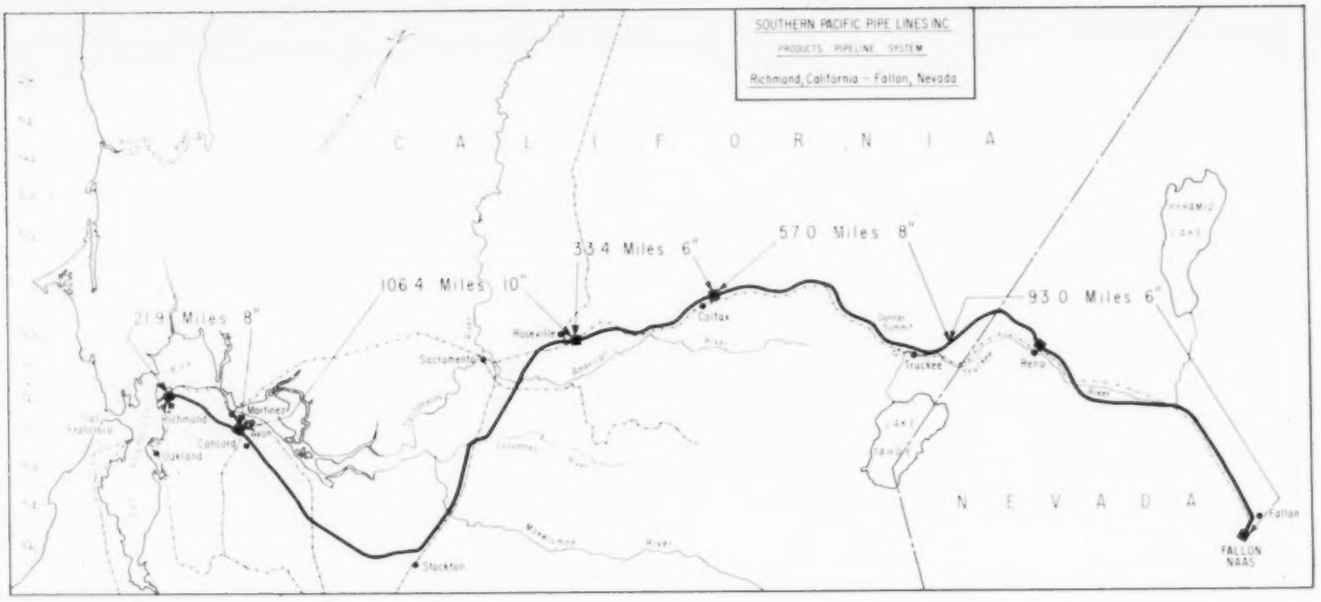
Pipeliners encountered varied terrain from San Francisco Bay up over historic 7100-foot Donner Pass to reach western Nevada terminals.

By Gilbert M. Wilson, PIPE LINE INDUSTRY Staff

A 312-MILE products pipe line system recently completed by Southern Pacific Pipe Lines, Inc., starts near sea level in the San Francisco Bay area and quickly climbs to an elevation of over 7100 feet in crossing the Sierra Nevada Mountains to deliver products to Reno and Fallon, Nev. Contractors overcame plenty of tough construction problems on the job; the new line will face some unusual operating conditions because of elevation changes and high pressures.

The $16 million project, involving 6-, 8- and 10-inch pipe, will have an initial capacity of 15,000 barrels per day, with provisions in the design to permit later enlarging of throughput if necessary. Principal products to be handled include aviation, premium and regular gasolines, jet fuels, diesel fuels and stove oil. The line will serve various communities and domestic outlets; also military installations, along the right-of-way.

As in the case of the company's first products line, completed early in 1956



Southern Pacific's new 312-mile, 8-inch products line from the San Francisco Bay refining area to Reno and Fallon, Nevada, parallels railroad right-of-way along much of the way. Route crosses historic Donner Summit at an elevation of 7100 feet.

and connecting Los Angeles, Phoenix and El Paso, much of the present line is located on Southern Pacific Railroad right-of-way.

Pump stations, equipped with electrically-driven centrifugal pumps, are located at Richmond, starting point of the line, and at Concord, Roseville and Colfax on the western slope of the Sierras. Operating pressures will range up to 2300 pounds per square inch in moving products "over the hump." Flow is by gravity from Donner Summit on down to Reno and Fallon terminals.

The project was constructed in four separate sections: Contractor for Schedule 1, Richmond to Stockton, was Morrison-Knudsen, Los Angeles; for Schedule 2, Stockton to Roseville, Hood Construction Company, Lynwood, California; Schedules 3 and 4, Roseville to Donner Summit and Donner Summit to Fallon, Engineers Limited, San Francisco, and J. E. Young Pipelines, Los Angeles and San Francisco.

Crossing Donner Summit. Route of the pipe line, pipe sizes and section mileages are shown in the map above.

The right-of-way, starting in low, rolling hills at the western terminus in the San Francisco Bay area, passes through sloughs, farm land, hills and increasingly rough, timbered terrain cut by numerous streams, canyons and ravines. Traversed, too, was part of the Mother Lode country, made famous by gold miners who flocked there in the Gold Rush of '49; an area that still has numerous operating mines.

About 7 percent of the route through hard rock required shooting; most of it was in the solid granite areas in and near Donner Summit.

In all but the rockiest portions, trenching specifications called for 30 inches of cover. In difficult rock areas, however, especially at the Summit where near-vertical slopes further complicated operations, 18 inches of cover was specified.

River crossings were ditched. No river weights were used, but pipe was mastic coated for extra protection. Among the larger water crossings were numerous branches and sloughs near the junction of the San Joaquin and Sacramento rivers, the Stockton Ship Channel, the Mokelumne, Cosumnes and American rivers and, on the eastern flank of the mountains, several crossings of the Truckee River. Many crossings were made also of smaller rivers and swift mountain streams. When cut by the ditching machines some of the small streams, complete with trout, promptly assumed new courses through the ditch for short distances.

Special Pipe Protection. For most of the line, pipe in 45-foot joints, was yard-wrapped and delivered in single joints to stockpiles along the right-of-way, from which it was trucked by pipe stringing crews. From the starting point up to near Stockton, a section comprising mostly flat terrain to rolling hills, pipe was given a double coat of asphalt primer and was double-wrapped. From there on, in the mountainous terrain, pipe was given a single asphalt primer coat and a single wrap of reinforced glass fiber.

In rock areas and wherever ditch conditions required it, pipe was given additional protection with an asphalt type rock shield held in place by steel bands. In some sectors where chances of damage to pipe coating was severe, ditch bottoms were padded with sacks of sand. In addition, fine sand and soil backfill was brought in to cover the pipe, and rock fill was placed by hand to prevent injury to the coating in several sections.

Plenty of Blasting Needed. Conventional ditching equipment was used wherever possible, but there were some places where only a backhoe could work. Very steep, at times near-vertical slopes, particularly near the summit, sometimes required that a tractor hold back on the backhoe unit while the latter cleaned the freshly shot ditch. In other tight spots, the ditch had to be shot, then backfilled with a dozer so the backhoe could travel over it in making the final clean-out ahead of stringing and welding crews.

Pressures Required Heavy Wall Pipe. Wall thickness of pipe varied widely due to the conditions, pipe sizes and operating pressures involved. Generally speaking, however, wall

thicknesses of from ¼-inch to .430-inch were used. Some seamless was employed, also, in the 8-inch pipe section at the Summit.

In many areas, particularly in the higher elevations where the going was rougher and where work space beside the ditch was limited, pipe was brought out in semi's and parked at a convenient point. Side booms then picked up each joint, bent it as needed, and moved it to the right-of-way for line-up.

Many Welds in Mountains X-Rayed. Typical welds included a stringer and three passes. About 20 percent of the welds were X-rayed, this ratio being increased, as needed, in mountainous regions.

After welding was completed, segments of the completed line were pressure tested with water.

Discharge pressures at each of the pump stations, depending upon throughput volume and operating conditions, are expected to be as follows:

Richmond	425 psi
Concord	580 psi
Roseville	1200 psi
Colfax	2150 psi

Engineering Management, Inc., engineering firm of San Francisco, had charge of the construction, design and inspection of the project.

Boring beneath the railroad tracks in solid rock called for special blasting methods. Driving the large conduit required placing small shots at the face of the bore; after shooting, muck was removed in the caster-mounted tub. The conduit was then driven forward by the gas engine-powered hydraulic ram.

Dozer-backhoe team (left) cleans out freshly shot ditch in solid granite terrain near Donner Summit. In rocky ditch, only 18 inches of cover was specified. SP railroad and still effective snow sheds are visible above the pipe line route in the background. Side boom (right) strings pipe ahead of line-up crew just east of Donner Summit. Sandbags in ditch prevented damage to coating. Trucked-in ditch padding and rock shield were later used to protect pipe prior to backfill. The granite ditch required special attention to overbends and sidebends such as this one. —The End

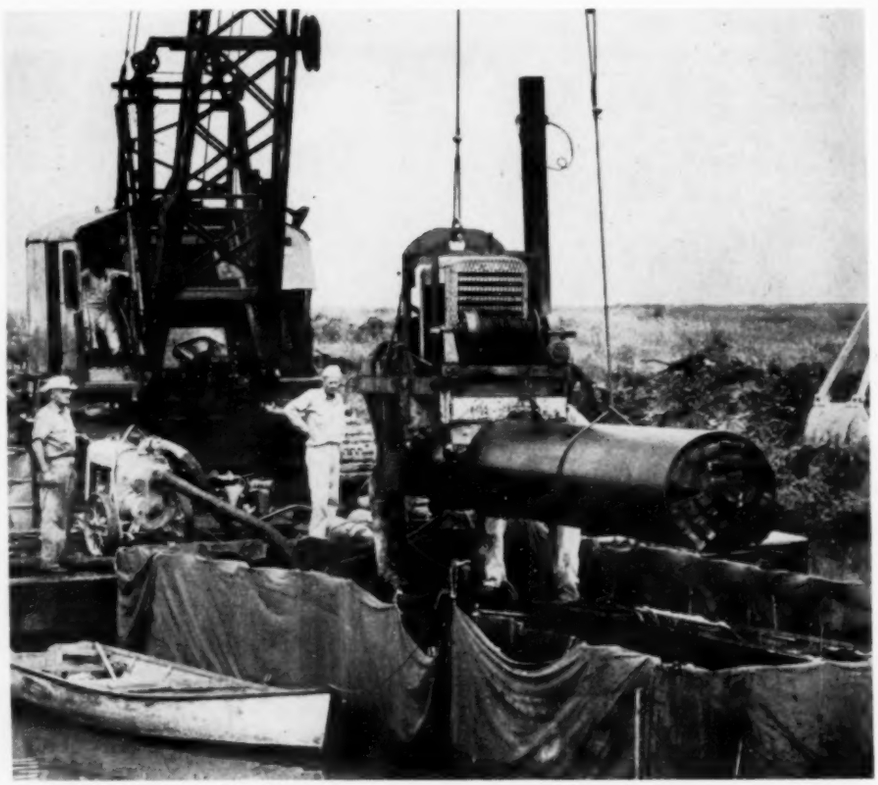
Boring Pipe Line Crossings in Marsh Aided by Cofferdams

Cofferdam provides dry work area to permit boring two difficult pipe line crossings in Louisiana swamp.

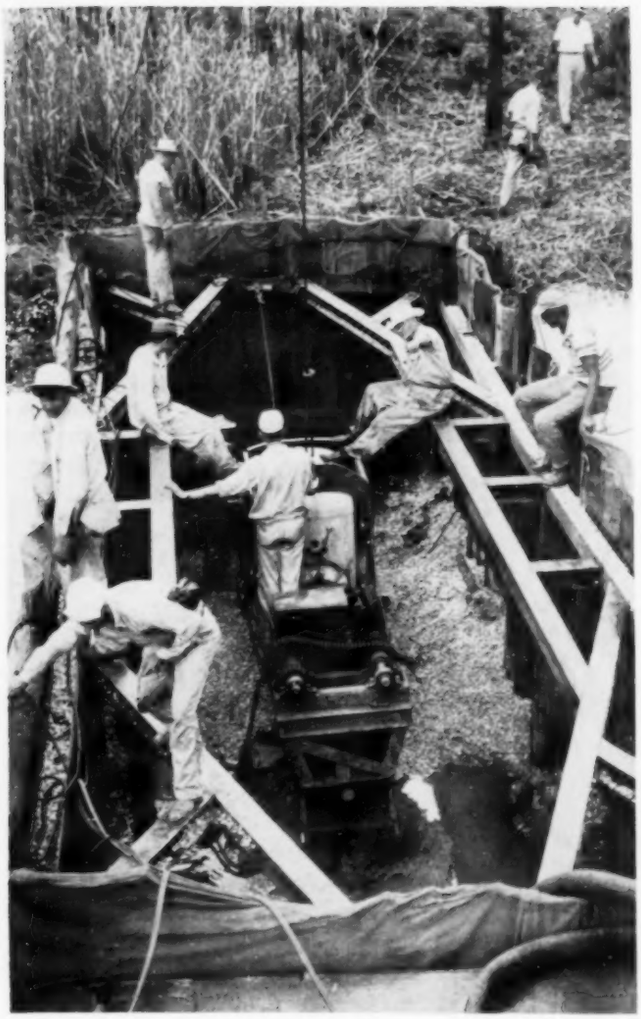
Boring machine is lowered over first joint of casing. Pilot drill can be seen in end of pipe. After machine is secured to casing, the unit will be lowered from barge into dry area provided by cofferdam.

INSTALLING casing under a railroad and highway to construct a bypass on Southern Natural Gas Company's 20-inch line in the South Louisiana marsh east of New Orleans called for special innovations by the contractor, Brown & Root, Inc. Since the area on both sides of the tracks and roadway was under water, cofferdams were built to provide a working area for the boring crews. Pilings were driven to give room for the boring machine and one joint of casing; the cofferdam was then pumped dry. All operations were conducted from the deck of a barge alongside.

After the cofferdam was completed, the boring machine was secured to a joint of casing, the drilling bit installed inside the pipe, and the assembly lowered into the working area. As each joint of casing was pushed under the crossing, the machine was raised and attached to another joint. Each new joint was welded to the protruding end of the casing already in place and the operation continued. This procedure was repeated until the crossing was completed. With the casing complete, the line pipe was pulled through the casing.



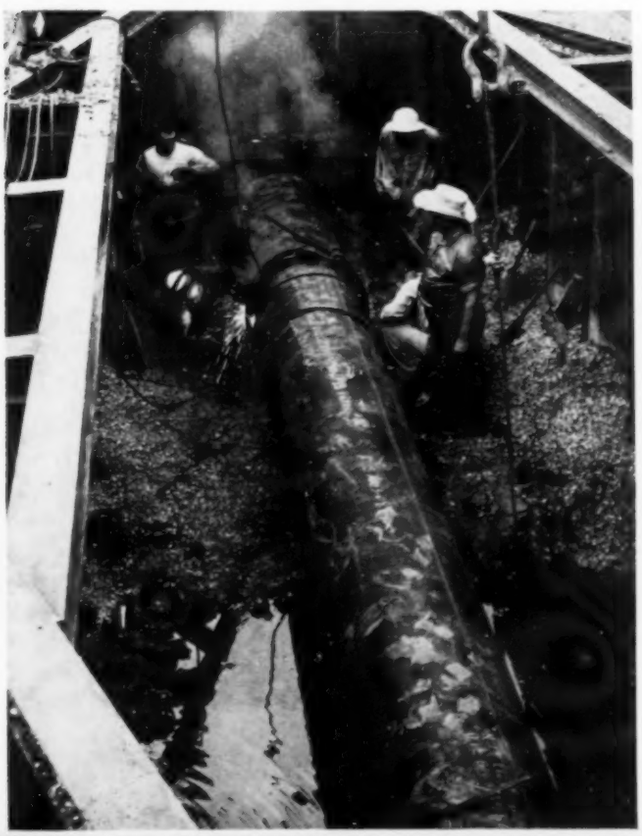
Crane lowers boring machine secured to casing into working area provided by cofferdam. Additional joints of casing and drilling bits can be seen on barge. Pump removes seepage to keep area dry.

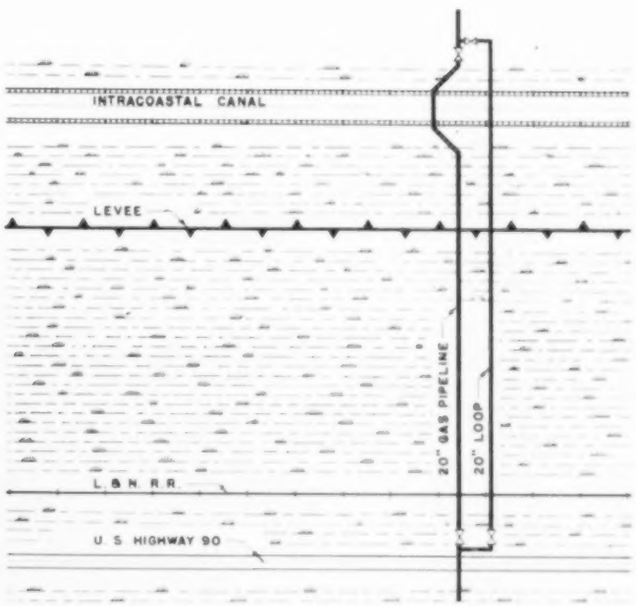


(At left) Boring machine in operation. Supported by crane, after one joint of casing is in place, the machine will be returned to barge and secured to another joint. The entire unit will then be returned to the pit and the new joint of casing welded to the end of the last joint in place.

(Below) Cofferdam constructed in south Louisiana swamp provides dry work area for boring railroad crossing. Operations are conducted from barge. This operation took place duing looping of a portion of Southern Natural Gas' 20-inch line east of New Orleans, Louisiana.

(Below) After being lowered into pit, new joint is welded to joint already in place. This operation will be repeated until the entire crossing is cased. After the casing is complete, the line pipe was pulled through the casing.





(Above) Operations were complicated due to marsh in the area. Purpose of the loop was to provide a by-pass for gas while the existing line was lowered under the canal.

Beat the Freeze!

Ammonia is effective in hydrate control, but safety rules should be observed.

By Joe Laird, Production Superintendent
Hugoton Production Company, Ulysses, Kansas

UNDER CERTAIN operating conditions ammonia is very effective in controlling hydrate formation in gas pipe lines. It can be injected with a lubricator in the same manner as alcohol, or a meter run can be blown down, filled and then repressured to force the ammonia into the line.

In removing hydrates from a gathering system, a short lease line is blown down, a slug of ammonia injected, and the line repressured to force the ammonia into the system. As with any solvent, gas must be flowing to carry the ammonia to the hydrate constriction.

Inject Near Constriction. Ammonia should be put in the line as near the freeze point as possible. On large lines it will sometimes pay to install a one-inch hot tap about 100 feet from the constriction.

Solid freezes that cannot be blown out can be cleared by draining down one side of the freeze, injecting a slug of ammonia, then repressuring the line to carry the saturated gas to the freeze point.

Drain Drips Before Injection. Before injecting ammonia into a line all drips should be blown to clear out any fluid that might absorb the ammonia. Water at varying temperatures will absorb from 700 to 1200 times its own weight of ammonia.

Steady Flow Most Effective. Greater efficiency can be obtained when controlled rates of ammonia are pump-injected with a steady flow. This is especially true with larger lines where more ammonia is required to clear the hydrate formation.

To be effective, ammonia must be injected at a rate greater than 0.0042 percent by volume. This is a much smaller amount than the slugging method. Ammonia will create about 20 standard cubic feet of gas per pound at 20°F, when used for hydrate removal. Knowing the amount of gas passing, the rate at which ammonia should be injected can be easily calculated. However, rather than depending on a rule-of-thumb, the judgment of the operating crews frequently indicates the proper amount to be used.

Ammonia as Hydrate Inhibitor. By the use of pumps or lubricators, ammonia can be used to inhibit hydrate formations. A small metering pump should be used for this purpose. Lubricator flows have been controlled by the use of sight feeds or orifice plates. Sediments have always been a problem, but when proper flows are maintained, ammonia will prevent hydrate formation in a pipe line.

Because ammonia comes under pressure, it is more convenient than alcohol in filling lubricators or getting suction to a pump.

Since ammonia will react with carbon dioxide in the presence of water, forming ammonium carbonate, the amount of CO_2 in the gas must be considered before ammonia is used.

—The End

Precautions Necessary When Using Ammonia

Although ammonia is not a dangerous chemical to handle, certain safety precautions should be observed.

1. No copper or copper alloy fittings should be used.
2. Flexible hose should be used in fill lines. Expansion of ammonia from cylinders can cause breaking of rigid fittings.
3. Observe physiological precautions. Ammonia can cause irritation to skin, and even sickness if inhaled in sufficient amounts.
4. Watch fire hazards. Although ammonia will not burn in air, *it is explosive* if concentration in air is between 16 and 27 percent.

Know Ammonia's Physiological Effects

When dissolved in water ammonia forms a caustic solution which is the basis for most of its physiological effects.

1. Prevent contact with the skin. In addition to the caustic effect when dissolved in skin moisture, ammonia can cause severe dermatitis.
2. Breathing ammonia vapor should be avoided. The gas will be dissolved in moisture and damage membrane in the respiratory system. An atmosphere containing from 0.25-0.45 percent is dangerous in 30 to 60 minutes, under 0.05 percent it is safe indefinitely. Because of ammonia's overpowering odor, an overdose by breathing is very unlikely unless the victim is unconscious.

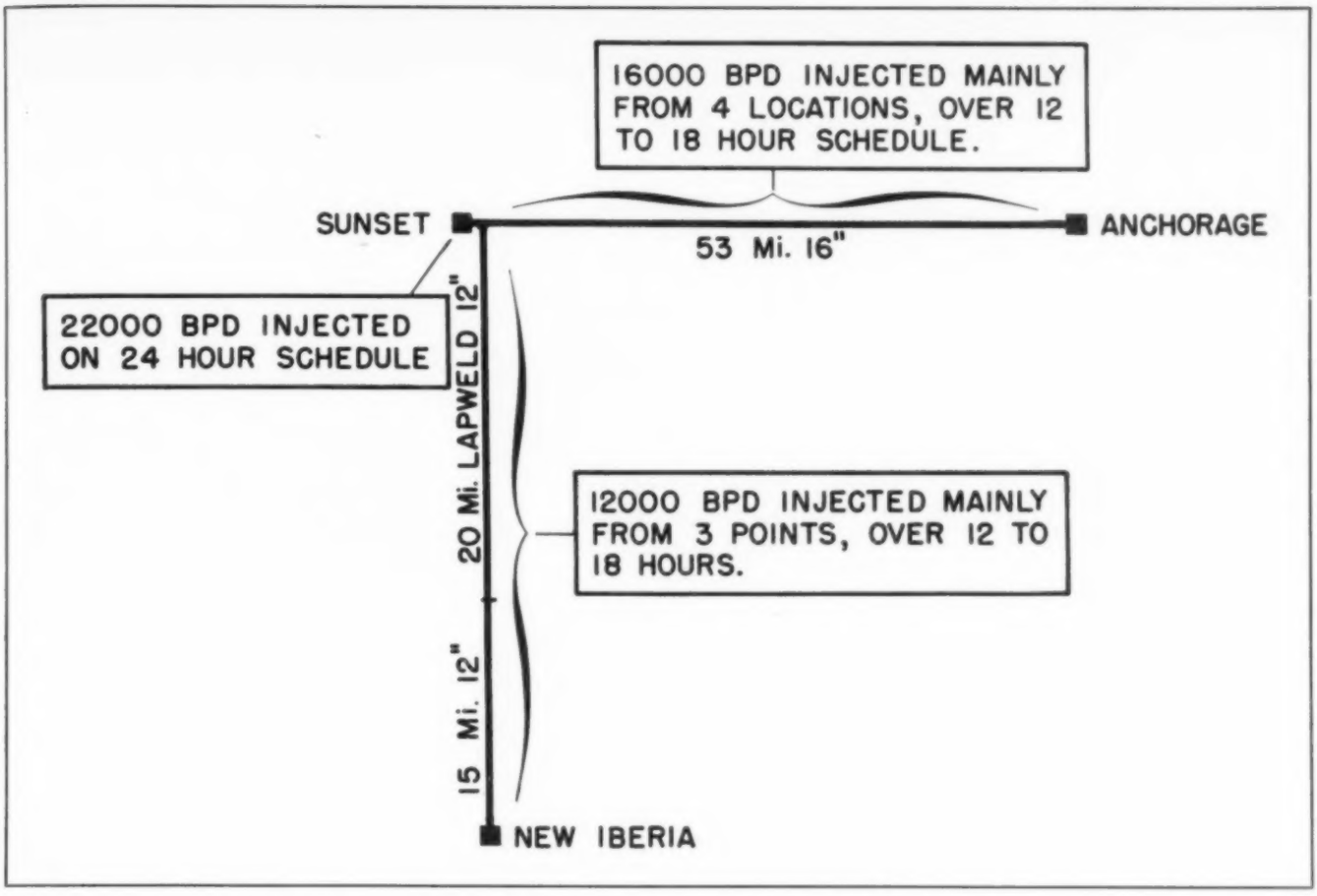

16000 BPD INJECTED MAINLY FROM 4 LOCATIONS, OVER 12 TO 18 HOUR SCHEDULE.
SUNSET
ANCHORAGE
53 Mi. 16"
22000 BPD INJECTED ON 24 HOUR SCHEDULE
20 Mi. LAPWELD 12"
12000 BPD INJECTED MAINLY FROM 3 POINTS, OVER 12 TO 18 HOURS.
15 Mi. 12"
NEW IBERIA

FIGURE 1—Flow diagram of Interstate Oil Pipe Line's New Iberia to Anchorage system. Injections at scattered points cause variable load at New Iberia Station. Pumping capacity at New Iberia must be flexible to allow for varying conditions.

Variable Throughput with Constant Speed Drive

Sizing impellers of three pumps gives combination which will handle any load condition expected.

BY R. B. Giezentanner
Interstate Oil Pipe Line Co., Shreveport, La.

WHEN ECONOMICS dictated conversion of its New Iberia (Louisiana) station to remote operation, Interstate Pipe Line Company was faced with the problem of maintaining variable throughput with constant speed electric motors. After studying several alternates, the problem was solved by varying the size of the impellers in three pumps. In this manner, a combination of pumps would be available to handle any load condition expected.

Interstate's New Iberia station handles an average of 35,000 barrels of crude oil per day, pumping on a 24-hour schedule through approximately 35 miles of 12-inch line and then through about 53 miles of 16-inch line into Anchorage terminal near Baton Rouge, La. Sunset station, at the junction of the 12-inch and 16-inch lines, injects into the stream some 22,000 barrels per day, relatively even over the entire 24-hour period. A schematic outline is shown in Figure 1.

Approximately 12,000 bpd is injected between New Iberia and Sunset, mainly from three points. Between Sunset and Anchorage, about 16,000 bpd is injected, mainly at four locations, though there are several small injections. Over both sections the additional 0.1 is injected during the first 12 to 18 hours of the day, which leaves only Sunset and New Iberia pumping into the line during the late hours of the night.

Injections by PD Pumps. Because of the large quantities of the injection and the fact that all of them, including Sunset, are handled by positive displacement pumps, the line pressure at New Iberia varies over a wide range. In the past, this has caused

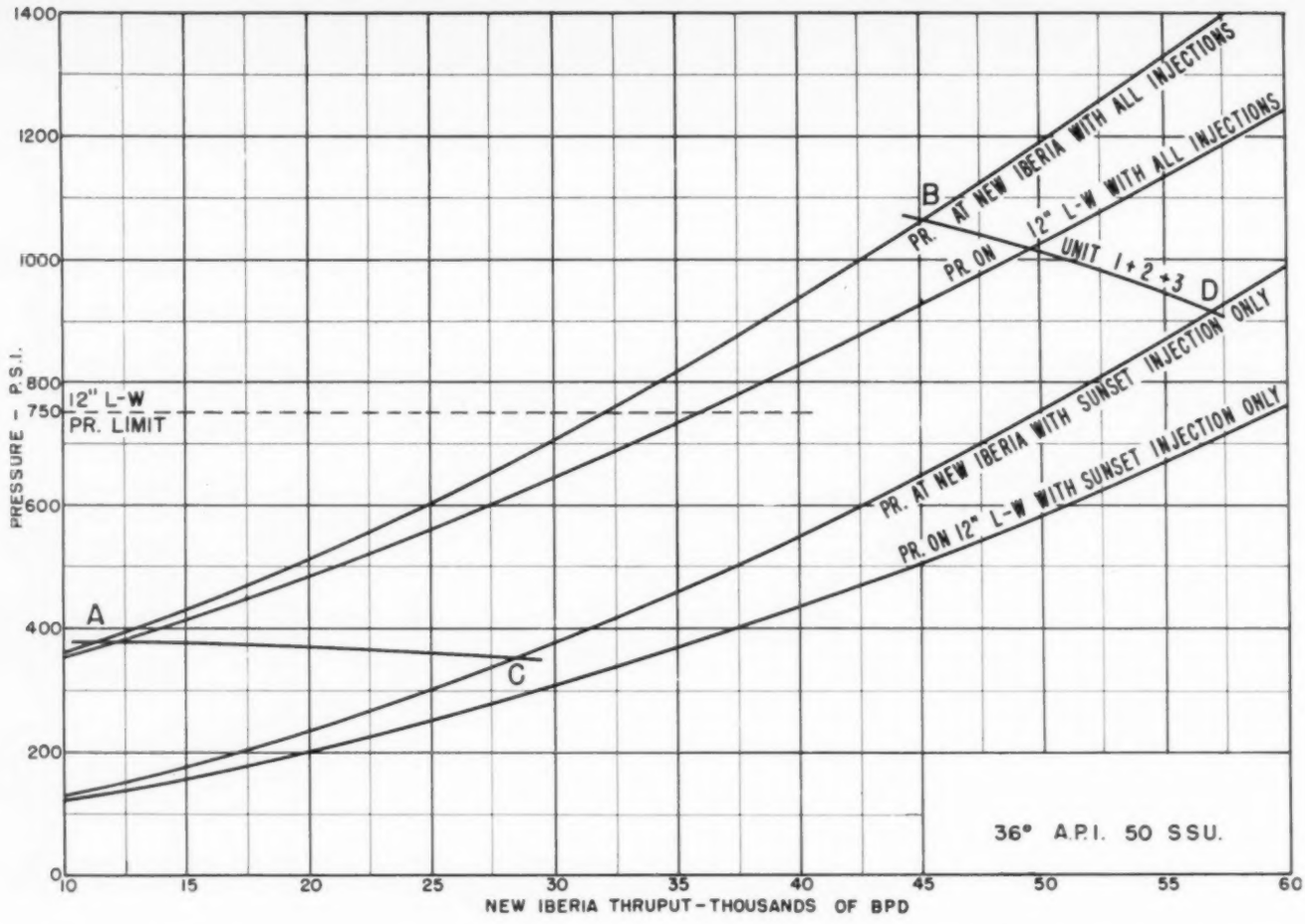


FIGURE 2—Capacity chart for New Iberia to Anchorage system before conversion of New Iberia from variable speed to constant speed drive. Before conversion New Iberia could be operated at any point within ABDCA, limited only by pressure limitations of pipe.

no particular operating problem at New Iberia with the variable speed engines driving centrifugal pumps through geared speed increasers.

As shown in Figure 2, the pressure at New Iberia could be easily varied to any point along curve A to B with all injections on, or to any point along curve C to D with only Sunset injecting. Expressed another way, New Iberia with the engine drive could be operated at any point within the drawing, A, B, D, C, A on Figure 2, limited only by the allowable pressure on the line pipe.

Change to Constant Speed Drive. When it was decided for reasons of economy to convert New Iberia to completely unattended electric motor drive, operated entirely from a remote point, the problem of variable throughput was recognized. The three pumps from the engine driven station were to be utilized, but as they were all alike including the same size impellers, very little flexibility could be obtained after the conversion to constant speed prime movers. Further complicating the problem was the pressure limitation of the 12-inch lapweld pipe which begins only 15 miles downstream from the station. This pipe's pressure limitation of 750 pounds is shown on Figures 2 and 3.

Throttling Valve Undesirable. Use of a throttling valve in the station discharge line was thoroughly investigated. The necessary, or even the desired, variable throughput could have been secured by such a valve. It was also recognized that should full line utilization be necessary, it could be realized only by variable speed drive, or by the use of a throttling valve. Since this was not required at this time, and the quantity to be throttled would be quite large under certain conditions, the idea was discarded for reasons of economy in operation.

Cost Limits Choice. The use of variable speed motors was considered, as was also the use of variable speed couplings. High initial cost and probable high maintenance for unattended operation made both appear unattractive, since they were considered slightly less reliable than straight drive.

Varying Impellers the Answer. Varying impeller sizes in the pumps gave the necessary variation in step form. The No. 3 pump impeller was left as it was, which is near the maximum size; No. 1 pump impeller was cut to the minimum and No. 2 filled in between No. 1 and No. 3.

Figure 3 shows graphically the results obtained. Used either singly or in any combination of two's, a total of six different pressures and throughputs can be reached at New Iberia. Note that the two larger pump impellers, No. 2 and 3, are sized so as not to exceed the allowable pressure on the lapweld 12-inch pipe; point E on the curve in Figure 3.

Station Output Greater at Night. For another example, on Figure 3 refer to the curve marked Units 1 and 2, which shows that with all injections on, these two units would be operating

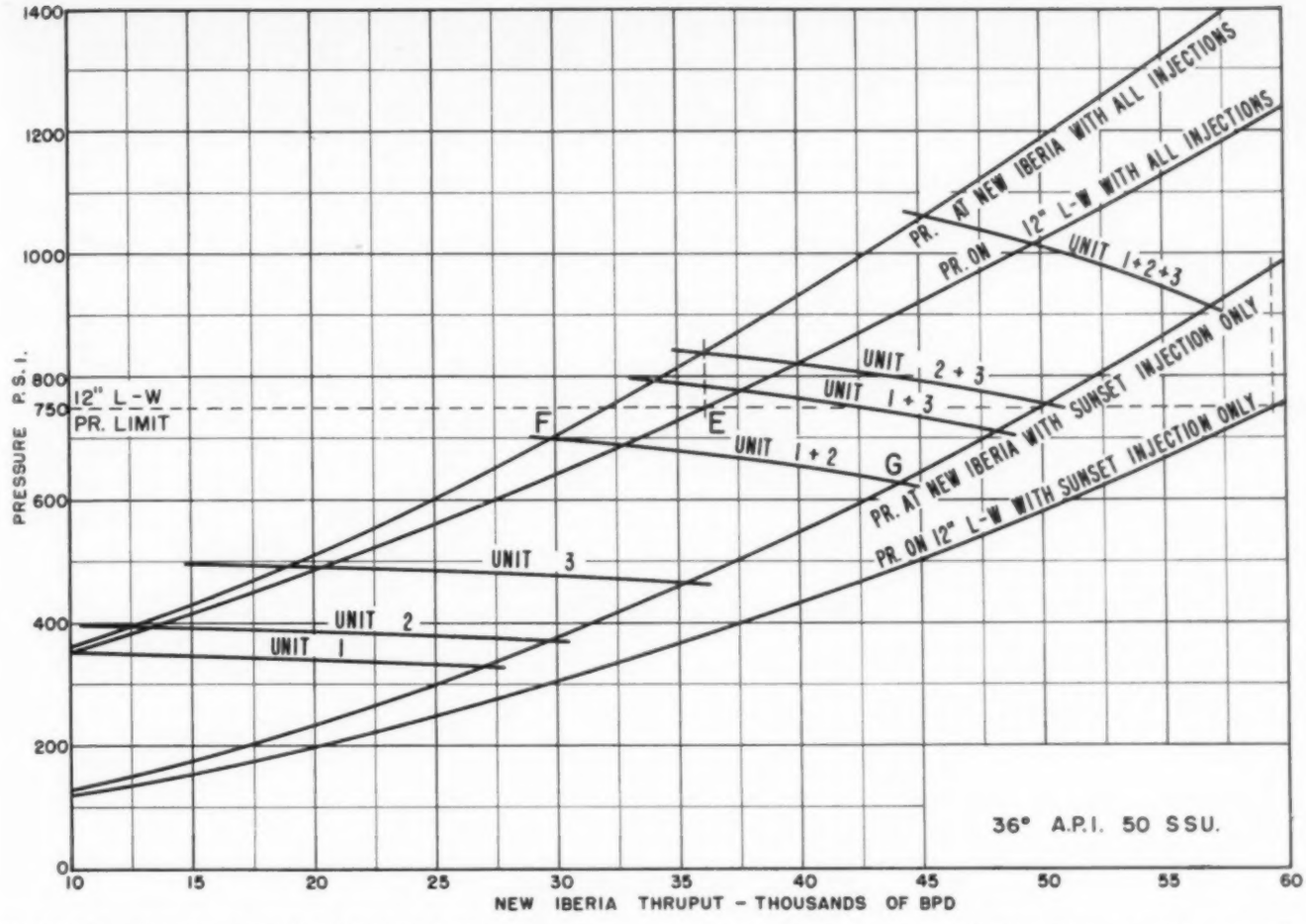


FIGURE 3—Capacity chart for New Iberia to Anchorage system with varying impeller size and constant speed drive. Used either singly or in any combination of two, a total of six different pressures and throughputs can be obtained at New Iberia.

at Points F. As the injections drop off during the latter part of the day and the early part of the night, the output of New Iberia increases though the pressure as the station decreases. When all the injections are off except Sunset, Units 1 and 2 will be operating at Point G.

All three units cannot be used together except when all or nearly all of the injections except Sunset are off.

Normal operating plans are to use only one unit, usually No. 2 or No. 3, when the injections are the greatest, during which time New Iberia output will be under 20,000-bpd rate. As the injections drop off a second unit will be started. Two units can operate up to a 50,000-bpd rate.

Tank Smooths Load Factor. An existing 55,000 barrel capacity double deck floating roof tank at the station is used to accumulate the excess incoming oil during the day. The tank is then pumped down during the night when the injections are either low or down, smoothing out the load factor of the station and permitting more economical operation.

Safety Controls Provided. To improve the reliability for unattended operations, the pumps were equipped with mechanical seals during the conversion. While it is not the intent in this article to go into a discussion of the methods of safety controls, the functions provided for are these: Seal failure detection, alarm, and shutdown; high bearing temperature detection, alarm, and shutdown; high pump case temperature detection, alarm, and shutdown; and, pump vibration detection, alarm and shutdown. For protection of the 12-inch lapweld pipe, excess pressure at the junction of this pipe will cause shutdown of No. 3 pump.

While New Iberia has only been operating electrically and by remote control for a few months, there is every indication that its operation is going to provide adequate flexibility and be entirely satisfactory.

—The End

About The Author

Robert B. Giezentanner, section head of general engineering, for Interstate Oil Pipe Line Co., joined the Engineering department of one of the company's predecessors, Oklahoma Pipe Line Co., before World War II. During the war he was loaned to War Emergency Pipeline, Inc., as a station design engineer. In 1951 he was named oil measurement engineer for Interstate and the following year promoted to his present position. Giezentanner was graduated from Oklahoma A & M College with B.S. degrees in both mechanical and electrical engineering. After working for Commonwealth Edison Co. in Chicago for a number of years, he joined Carter Oil Co. at Seminole, Okla. His next affiliation was with Oklahoma Pipe Line.

Boise Pump station distribution manifold. Vertical pumps used on main line shown at left. Two 8-inch lines terminate in manifold. Products are directed to tankage for rescheduling through single 8-inch discharge.

Pushbutton Controls Switch Tanks

New design allows increased capacity with present operating personnel. Operator handles deliveries efficiently from control room.

By Benjamin W. Buzzo, Salt Lake Pipe Line Company, Boise, Idaho

A MAJOR CAPACITY increase in the products pipe line system of Salt Lake Pipe Line Company features:

- Unattended control of all product switching in a new pipe line tank field of 13 tanks.
- Wide flexibility in the functions that can be performed in the manifold.

The remote control of all manifold valves and booster pumps makes it possible to operate the new facilities without increasing the regular operating personnel of adjacent Boise, Idaho, pump station.

Products are received from Salt Lake City at the Boise station through two parallel 8-inch lines. Between Boise and the terminus of Spokane, Wash., is a single 8-inch line.

To maintain segregation, it is necessary to divert the incoming stream into tankage at Boise. This required a new tank farm with 13 tanks and the necessary manifolding to allow filling or taking suction on any of these tanks. All switching can be done from the pump house through the remote control of manifold valves and booster pumps.

Parallel Lines Segregated. Prior to the 1956 capacity increase project the parallel 8-inch lines were operated as separate lines, each carrying a share of each product. One line had a limited number of take-off points and the other made deliveries at all take-off stations. The economic choice for in-

reasing the capacity of the existing parallel lines was to change completely the method of their operation by designating one line as a gasoline line and the other as a gas oil line, and making deliveries from each line at all take-off points.

By this method all products tendered for delivery beyond Boise are, with a few exceptions, diverted to tankage at Boise. Batches are rescheduled for delivery through the single line beyond Boise. Accomplishment of this change in operation, which was part of a long-range plan, required new tankage and a manifold for the control of product movement into and out of the tanks. Tankage and manifold were the chief items constructed to increase the capacity of the lines between Salt Lake City and Boise from 42,000 bpd to 45,500 bpd and between Boise and Pasco, Wash., from 21,500 bpd to 24,500 bpd.

Design Problems Solved. Compared with other products pipe lines the Salt Lake line is of moderate capacity. Several features of its operation, though not unique, do pose some unusual operating and design problems:

- Small batches. Minimum tender is 10,000 barrels. Minimum delivery at the final destination is 5000 barrels.
- Maintenance of product identity for shippers rather than common stock handling.
- A short (10-day) pumping cycle between repetition of a series of products.
- Small terminal storage capacity maintained by the shippers.

These limitations (the pipe line company provides no terminal tankage for shippers) led to use of numerous, moderate-sized tanks and manifolding designed especially to simplify frequent switching of tanks and intertank transfers.

The distance between the tankage operating points and existing pump station would require additional operating personnel if the operations were done manually; automatic equipment was the answer.

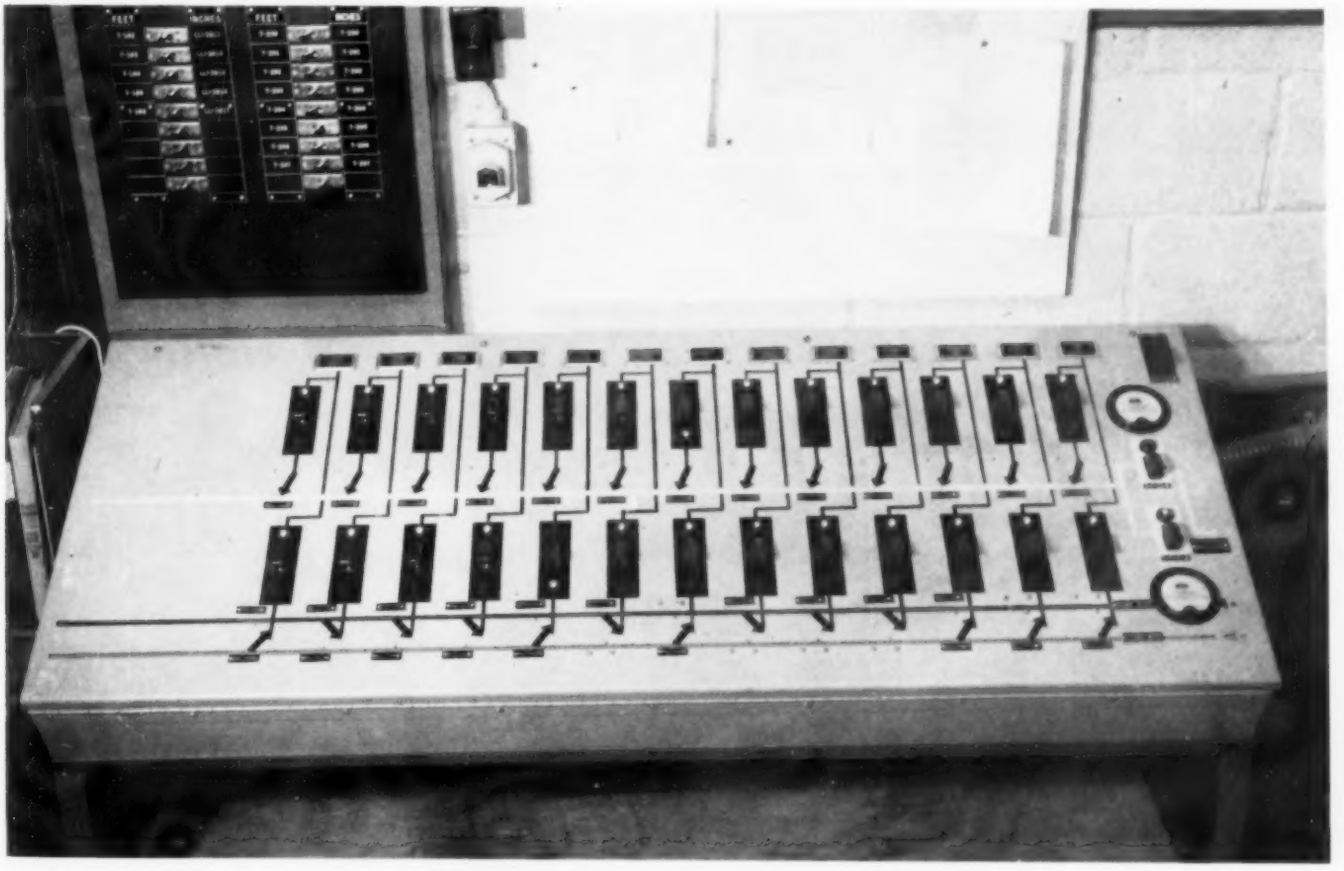
New Features Added. New features required to make the change in operating methods are:

- Remote gaging from pump house control room of 13 tanks with an aggregate capacity of 375,000 barrels.
- A central manifold located about midway between the main line pump house and the most distant tank.

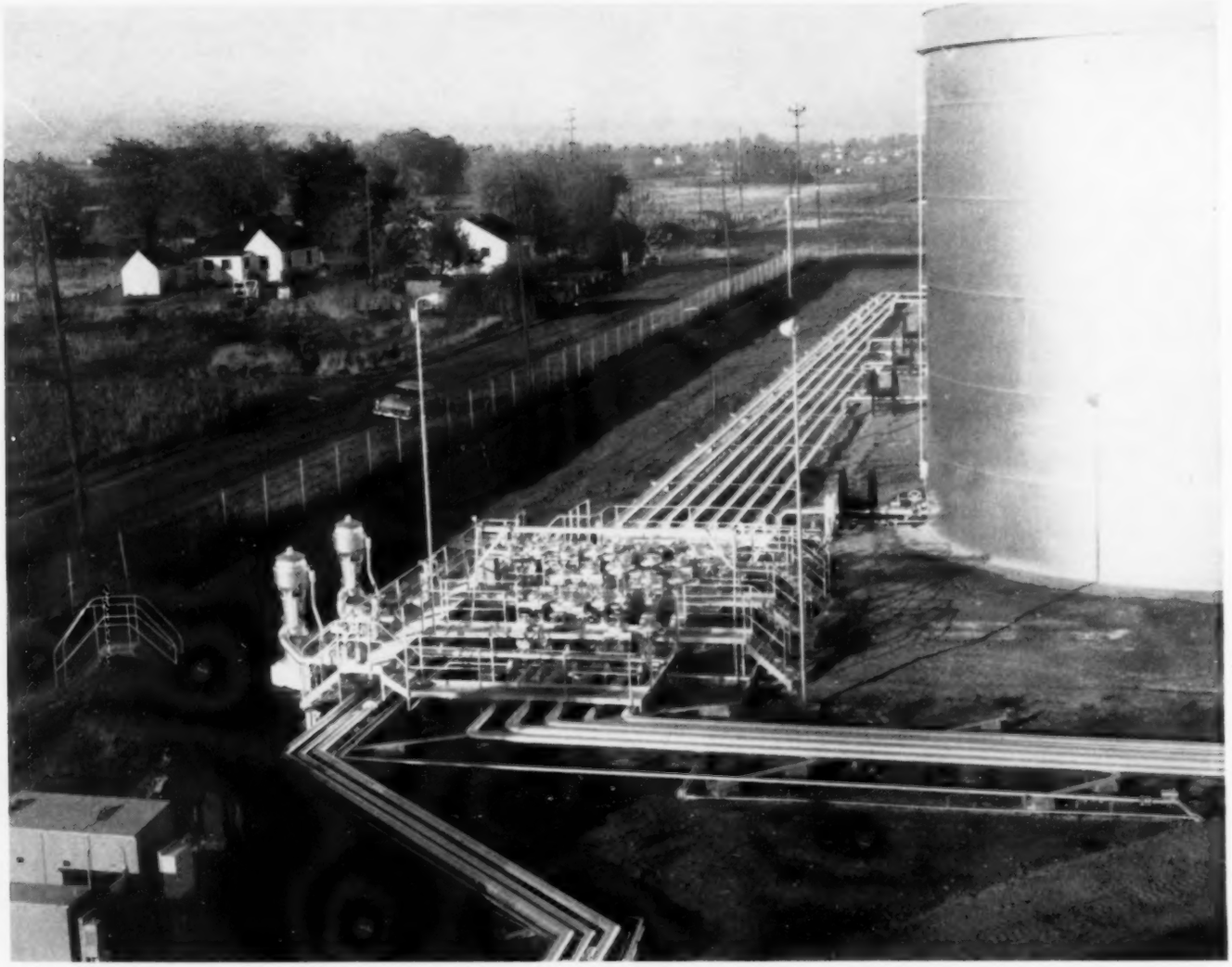
The manifold controls the transfer of products from two incoming trunk lines to tankage and from tankage to the main line pump station for shipment through the single outgoing trunk line. Thirty-two electric motor operated valves in the manifold control the filling and suction from tanks; they are remotely operated from the pump station.

- A low-pressure tank field booster pump station at the manifold pumps from tankage to the main line pump station.
- Separate lines connecting each trunk line at the pump house with the tank manifold, two for deliveries to tanks and one for shipments from tanks.
- Suction-fill lines are installed between each tank and the tank manifold.

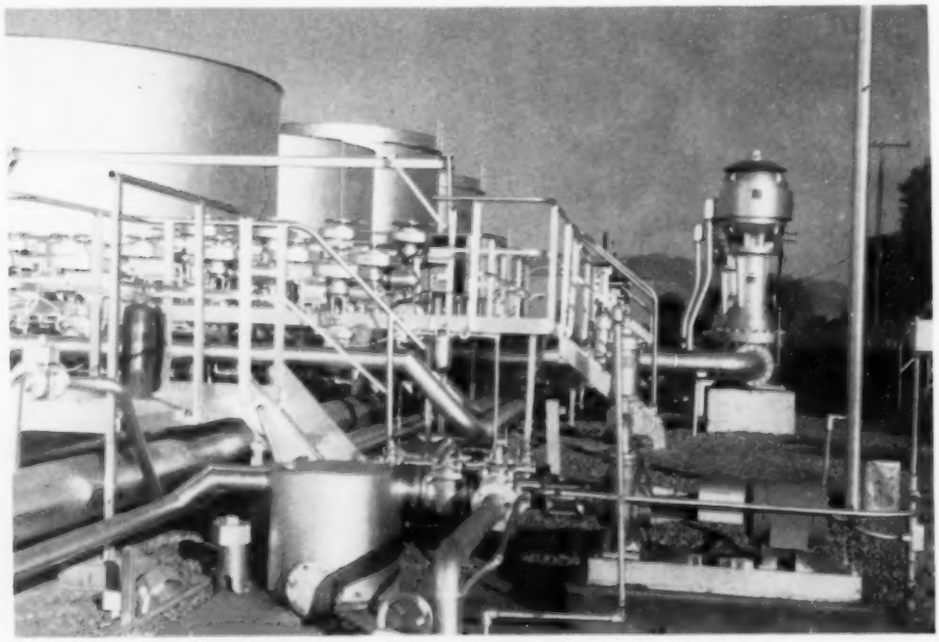
Deliveries Determine Tankage. The 13 tanks range in size from 15,000 to 67,500 barrels. Tank specifications were determined from consideration of the number and size of batches.



Control console for motor-operated valves in tank farm manifold. Thirty-two valves are controlled from this console. Valve operators are controlled by low voltage circuits. Signal lights indicate both open and closed valve positions.



Overall view of tank farm manifold showing motor-operated valves. Three lines at lower left connect the manifold with the main line pump station. Incoming product is diverted to tankage for scheduling through single 8-inch discharge line.



Close-up of tank manifold. Vertical booster pumps are shown at extreme right. Product sump and sump pump are in foreground. Valve body bleed lines empty into sump. A high-level alarm on tank indicates excessive valve leakage. Sight flow indicators in bleed lines indicate leaky valve. Product in sump can be pumped to any tank, a slop tank, or to an oil separator.

number of separate products to be stored, length of the pumping cycle (10 days), and seasonal variation in quantity and kind of products moved.

Seven tanks are assigned to either gasoline (several grades of motor gasoline and jet aviation fuel) or gas oil (diesel, stove oil, and furnace oil). Six tanks are designated as swing tanks and have special provisions for changing their assigned service seasonally from one type product to the other.

Valves Picked for Durability. Thirty-two motor-operated, solid wedge, gate valves, 4-, 6-, 8-, and 10-inch sizes are the heart of the tank manifold. Opening or closing time for the valves range from 17 seconds for the 6-inch size to 27 seconds for the 10-inch size. In comparing gate valves with plug cocks for the manifold service considerable weight was given to the difference in their lubrication re-

quirements. Gate valves have a distinct advantage from the operator's standpoint in unattended installations because plug cocks require periodic lubrication, whereas gate valves generally require only incidental attention. Valve seats have resilient inserts for tight closure.

Safeguards for Valve Leakage. As all operators know, no valve that depends on a single seal for certain separation between two different products, or two batches of the same product at different pressures, can be trusted implicitly to prevent intermixing. Valves in the Boise manifold have solid discs with a pipe connection in the valve body for bleeding off any liquid that leaks past either valve seat. The body bleed lines are controlled by solenoid-operated valves that are opened and closed as a part of the valve operating sequence by limit switches in the valve operators. Valve body bleed lines are connected to collection headers which carry leakage to a product sump.

A high-level alarm on the sump tank (sounded in the pump house), is one of the few items that require the presence of operating personnel at the manifold. Sight flow indicators in the bleed lines indicate which valve is leaking.

Control of the electrical valve operators is by low voltage (48-volts d.c.) circuits. The control station for the motorized valves is a console-type cabinet conveniently located in the pump house control room, some 800 feet from the manifold. Signal lights on the console indicate both open and closed valve positions.

Tank Design Varies. Tanks permanently in gasoline service and swing tanks used part of the time for gasoline storage have floating roofs. Tanks exclusively in gas oil service have cone roofs. Roof drains on floating roofs are open into the tanks.

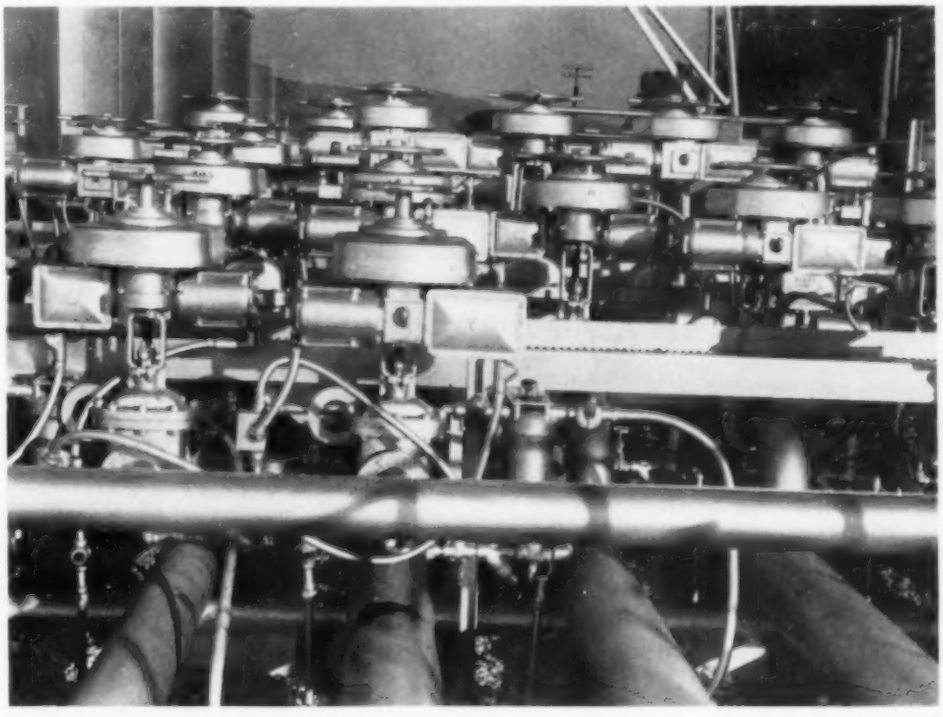
Tank bottoms are of two types: sloping (shovel) bottoms for the swing tanks to facilitate cleaning for seasonal product changes, and flat (cone) bottoms for tanks assigned to one kind of product exclusively and therefore requiring infrequent cleaning.

Booster Pumps in Manifold. Two 150-hp vertical, 4-stage, centrifugal, booster pumps at the tank manifold pump the product stream from tanks through a meter manifold and into the main line pumps. One of the pumps is a spare. Layout of the manifold provides space for a third pump for a future parallel pipe line on the discharge side of the pump station. Vertical booster pumps were the economic choice to satisfy the suction requirements imposed by the flat topography.

Maximum flow rate for which the pipe line expansion, as a whole, was designed is somewhat less than the rated capacity of the pumps. Under summer conditions, the pumps regularly pump even gasoline tanks down to about 15-inches from the bottom. Suction lines are up to 600 feet long on a slightly rising profile. The booster pumps are equipped with mechanical shaft seals.

Drip and Drain Collection. Drips and drains from the body bleed connection on manifold gate valves are piped to an underground sump tank. The sump serves two purposes; elimination of product waste, and warning, by a high-level alarm, of excessive leakage from the valve bodies. This alarm calls for the attention of an operator to determine the cause of the leakage. Product collected in the sump can be pumped to any tank, to any tank line in the manifold, to a slop tank, or to an oil separator.

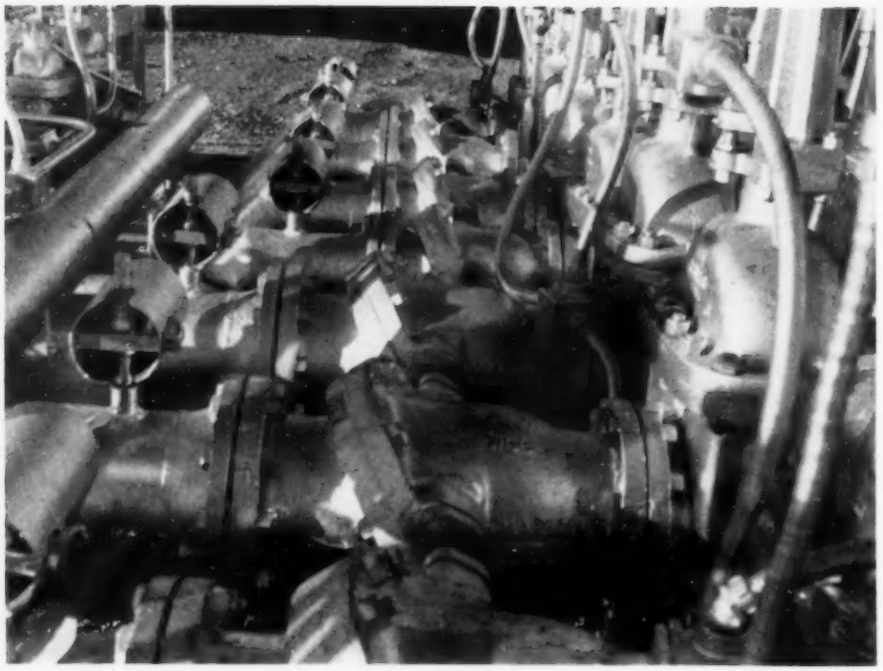
Pump-Out and Transfer Piping. For pumping out tank lines or completely emptying tanks a 3-inch pipe header connected to the product sump and sump pump is provided. The most frequent use for this piping is draining tanks preparatory to cleaning for a change of products. It is also useful for draining lines for maintenance. Transfer of product between any two tanks can be made with the same piping.



Electric valve operators in tank manifold. Operation is controlled from console in pump house. Product can be diverted to any tank from the incoming lines by line-up of valves in manifold. Deliveries to downstream stations are also controlled through manifold.

One Operator Switches Tanks. Normally, the single operator at the continuously manned main line pump station handles all switching of deliveries into tanks and main line suction switches without leaving the pump station control room. Remote tank gages provide the operator with information for starting and terminating batches from tankage. Once the equipment was adjusted and had the minor deficiencies worked out, which took several months, the automatic feature of the tankage operation has been very satisfactory and according to design.

The one operating function that requires regular attention by an operator is the drawing of water from tanks. During the rainy season this requires



Check valves in tank lines. Not in original design, when making switches between tanks with large difference in head, a reverse flow between tanks was possible. Installation of check valves eliminated danger of this condition.

several man-hours after each storm; during the summer, very little.

Manual Operations Limited. With the exception of drawing water from the tanks all labor for operation of the tank field facilities that is not done by the pump station operator is in the category of maintenance functions. The year-around average is two man-days per week to:

- Draw water from tanks after each storm.
- Clean strainers in gate valve body bleed lines to prevent incomplete closure of solenoid-operated valves. This is required at intervals of about 30 days.
- Check level in product sump weekly.
- Gage each tank by hand once a month for accounting records.

Problems During Shakedown. As is usually the case with any installation of automatic equipment, time was required to solve operating problems. Initial operation of the Boise tankage facilities was not as satisfactory as it was planned. The problems solved are presented here with the thought that they may be of some benefit in the planning of other installations of similar equipment.

Check Valves Added. Initially the manifold piping did not have check valves in the tank lines. It soon became apparent that when making switches between two tanks with a large difference in product levels (tanks are 48 feet high) there could be a reverse flow between the tanks while two motor-operated valves at the manifold were open simultaneously (up to 27 seconds). Product contamination could result. The solution was the installation of a center-hinged check valve in each tank line.

Despite the relatively short pipe lines between the tanks and the control manifold, enough debris collected during construction to cause considerable difficulty for several months. Screens were found to be absolutely necessary to protect the solenoid-operated valves on the gate valve body bleed connections and the booster pumps. Small rocks lodging in the solenoid valves when in the open position prevented complete closing, causing the drains to flow to the product sump when the lines were used again.

Valve Seat Inserts. Valve seat inserts of a plastic material were used in the motor-operated gate valves to provide resiliency for a tight shut-off. The material used proved to be unsatisfactory because of its plastic flow characteristics. After a few months of service it had become compressed so much that it no longer served the intended purpose. If resilient seat inserts are used the physical properties of the material should be carefully considered.

Limit Switches Adjusted. Initially the valve operators were sequenced to de-energize the power circuit by a position limit switch on the valve stem travel with an over-riding torque switch as a safety measure. Variation in the travel required to effect tight closure was caused by the change in the thickness of the resilient valve seat inserts after continued use. This resulted in extreme difficulty in maintaining tight valve shut-off. If the seat insert shrunk in thickness the valve would no longer make a tight shut-off with the same valve travel required for a thicker insert. The solution was to change the adjustment of the valve operators to break the power circuit on closing torque.

Training of Personnel. Initial operation of the new manifold showed the great importance of an adequate training program to familiarize operating personnel with the new facility before placing it in operation. Men who have the responsibility of operating new equipment are now better able to cope with its intricacies and the normal problems of start-up by having a thorough understanding of its operation before meeting the problems first-hand. This kind of training must be a part of planning for start-up of facilities with automatic equipment as much as for more conventional manual installations.

—The End

About The Author

Benjamin W. Buzzo is division engineer for Salt Lake Pipe Line Company's Boise and Pasco divisions. He received a B.S. degree in mechanical engineering from The University of California in 1942. Following military service he joined the Engineering department of Standard Oil Company of California. In 1953 he moved to the Engineering and Construction division of Salt Lake Pipe Line Company.

Since construction of the first section of the line was during the dry season dust conditions were severe. A few miles of the right-of-way passed through thickly wooded sections, but most of the terrain was relatively flat. Bare pipe was laid above ground on concrete sleepers. Small streams and ravines were crossed by means of H-frames and larger rivers by suspension spans.

First Crude Moves Through Barinas Line

New 212-mile, 20-inch crude line can deliver 100,000 barrels daily to El Palito on Caribbean shore from Venezuela's Silvestre field.

WHEN CRUDE flow began recently through the new 20-inch line of Socony Mobil Oil Company de Venezuela and Sinclair Oil and Refining Company it spotlighted completion of the biggest oil pipe line construction job in Venezuela. This newly laid 212-mile line linking the Barinas Basin to El Palito on the Caribbean coast is the longest big-inch crude line laid in that country.

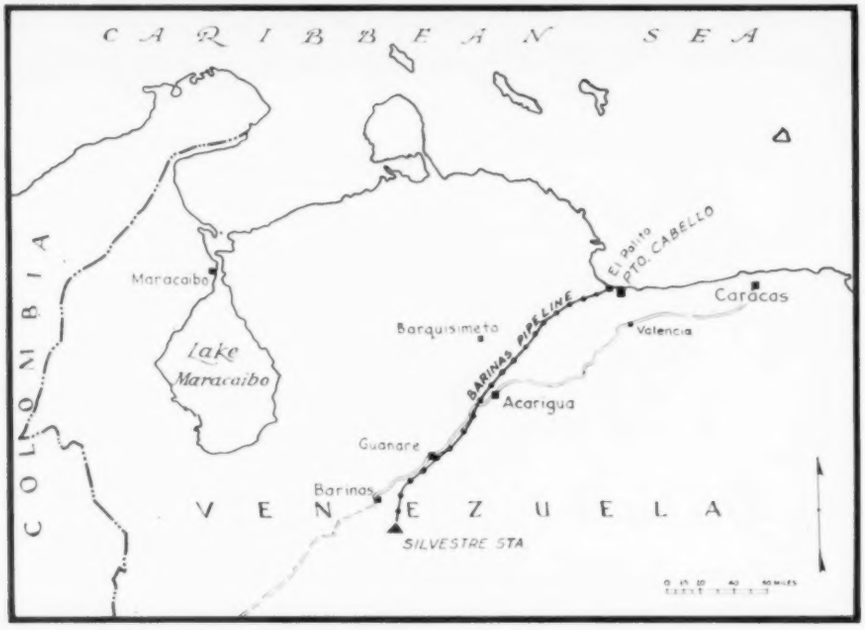
Built at a cost of $26-million, the line is designed for an immediate capacity of 100,000 barrels daily with a potential increase to 150,000 barrels. The only pump station on the line is located at the Silvestre terminal; it is equipped with three 2000-horsepower engines driving two-stage centrifugal pumps.

First joint of pipe was laid in January this year; construction was expedited as much as possible to take advantage of the dry season, which occurs regularly from December to May. Crews were thus able to avoid the season of heavy rains that take place the remainder of the year.

Conditions along the right-of-way varied from thickly wooded in southern sections of the line to occasional rocky outcrops north of the route midpoint. Most of the terrain crossed was relatively flat. There were some mahogany trees more than five feet in diameter that had to be cleared individually presenting an unusual problem in right-of-way clearance.

Line profile is at an elevation of about 425 feet for the first 63 miles, then rises gradually for the next 62 miles up to an elevation of 1250 feet. From the highest point, the line drops uniformly to the coastline.

Bare pipe was placed about 8 to 10 inches above ground on concrete sleepers. Some 32 streams were crossed by means of suspension spans



Route of new Socony Mobil-Sinclair, Barinas pipe line passes through open country most of the way. River crossings in the first 100 miles controlled location of right-of-way. By staying clear of towns builders could avoid the necessity of ditching and burying the line in these areas.

The 20-inch line pipe had a wall thickness of 5/16-inch except for ⅜-inch wall used in the first 35 miles downstream from the Silvestre pump stations.

and H-frames; the latter were used to support the pipe above ground in swampy areas and at small streams.

Only at submerged stream crossings and under roads was it necessary to coat and bury the pipe; these sections totalled only about three miles in length along entire right-of-way.

Magnesium anodes provide cathodic protection of buried sections. Coating specifications for the pipe included coal tar primer, coal tar enamel, glass fiber, and asbestos felt outerwrap.

Pipe U. S. Supplied. The 20-inch O.D. pipe supplied by U. S. mills consisted of both seamless and welded pipe. At river crossings, pipe with ½-inch wall thickness was used; ⅜-inch wall thickness pipe was utilized in the first 35 miles downstream from the pump stations at San Silvestre; and 5/16-inch thickness pipe was employed over much of the remainder of the line.

Pump Station Automated. Crude is delivered into the line from the Silvestre pump station by three units. Prime movers are V-type, 16-cylinder, turbocharged, dual-fueled engines rated at 2080 hp at 1000 rpm. Engines drive two-stage centrifugal pumps through speed increasers. For a throughput of 100,000 barrels daily, two units will operate in series with the third in standby. When production increases, plans call for operating the third unit in series and installing an additional unit for standby.

With another similar pumping installation at a booster station located near the midpoint of the line, capacity of the line could be increased to 150,000 daily. A location considered might be near Acarigua.

Line Crude Fuels Engines. Engines will use crude from the line for fuel. Crude found so far in the three fields, Socony's San Silvestre and Silvan Fields and Sinclair's Sinco Field, varies between about 21 and 30 degrees API gravity. The crude is asphalt base and will be mixed in storage and in the pipe line initially, though batching can be done later if necessary.

Typical crude samples thus far analyzed have shown relatively low proportions of corrosive ingredients. One sample had a sulfur content of 1.12 percent, sodium, 1.5 to 11.5 ppm, and vanadium content, 0.015 to 0.043 percent. In a 100-hour crude oil burn-

ng test of crude that tested as just described, temperatures varied from 350 to 963° F.

Fuel Non-Corrosive to Engines. It appears, therefore, that the crude burning turbocharged diesel engines are neither apt to generate temperatures (1200° F. or above) at which internal corrosion rate tends to accelerate rapidly, nor are they expected, under current conditions at least, to burn highly corrosive crudes.

Terminal Facilities Completed. The tank farm at Silvestre, consisting of four 150,000 barrel floating roof storage tanks was completed during the summer. Tanks are equipped with remote reading gages; two electric mixers are installed per tank. PD meter banks are installed to measure oil flowing to the tanks. They will serve as a check of PD meter volumes against hand gaging methods; once the meters have been proved satisfactory to government authorities, permission will be asked for PD meter readings for purchase.

Included in the meter installation are continuous samplers, recording gravitometers, and a wier type prover tank. BS&W monitors will give an alarm if an excessive amount of BS&W appears in the incoming lines. The Silvestre station is served by two 16-inch gathering lines.

Modern Caribbean Terminal. The terminal at El Palito, overlooking the harbor at an elevation of 250 feet, utilizes five storage tanks with a capacity of 265,000 barrels each. A causeway 1150 feet long, has been further extended by a 1200-foot pier, providing berthing facilities for two tankers. Loading rate for the tankers is about 30,000 barrels per hour. The port installation includes a ballast pit with a capacity of 100,000 barrels.

Crude is transferred from the terminal to tankers through the loading lines by gravity. Water depth at the pier is from 40 to 45 feet deep. Over 325,000 cubic yards of earth was moved for construction of the El Palito terminal tankage.

Station Control Designs. At the Silvestre station, careful attention was given to design of controls. All controls, safety devices, and electric motor operated valves can be controlled from the central station control room. A schematic layout shows switches and indicator lights for tank

First weld was made on the Barinas line early in January 1957. Firing line crews averaged about 6800 feet per day. Record day of laying was 338 joints; the job was completed in six months.

mixers, booster pumps, motor operated valves, and roof ventilators.

Tank levels and engine speeds will be indicated by gages; automatic controllers and recorders monitor station discharge pressure, suction pressure, and line flow.

Audible and visible alarms will give warnings of high station discharge pressure, low station suction pressure, station flow out of desired range, high engine speed, high pump bearing or case temperature, pump seal failure, high sump level, instrument air failure, and BS&W content beyond limits.

Station fire protection is supplied by a water spray and foam fire control system which acts automatically or by manual control.

The new Barinas line is designed for a capacity of 100,000 barrels per day at an operating pressure of 1000 psi. It is conceivable that the initial capacity could be greatly increased if economic conditions warrant future expansion. Productive capacity in the Barinas area is now in the order of 50,000 barrels daily; that is the probable approximate daily figure in the early months of operation.

Initially, Sinclair proposes to move 30,000 barrels of crude daily to Silvestre station, where the 20-inch begins. Sinclair's production is moved from the Sinco Field via a 4¾-mile, 16-inch above ground pipe line. There are three field booster stations on this line, each equipped with three 25-hp electric-motor-driven reciprocating pumps.

Socony has a 75 percent initial equity in the line, with Sinclair holding the remaining 25 percent. Sinclair will have an option to purchase an additional 25 percent. Five years from commencement of operations, the ownership ratio will become firm, whatever it may be at that time.

U.S.-Venezuela Firms Build System. Williams Brothers was the contractor on the pipe line and station construction. They employed two camps of portable aluminum buildings. One camp was used to house the crew while the other was being set up at the next location. Pier facilities at El Palito were contracted by J. Rich Steers and Morrison-Knudsen. Tanks at both El Palito and Silvestre were built by Chicago Bridge and Iron Co. and earthmoving and terminal site preparation was by Conticca, a Venezuelan firm. —**The End**

Job Evaluation—What It Is And How It Can Help You

Too few pipe line companies are making use of this effective way to define job responsibility and set up consistent compensation policies.

By Robley D. Stevens
Management Consultant, Washington, D. C.

DISSATISFACTION OVER pay rates does more to impair employe efficiency, encourage absenteeism, lower morale and increase labor turnover than perhaps any other factor.

There is one sure way to eliminate this morale and efficiency destroyer—set up a sound and practical *job evaluation plan* based on a thorough *analysis* of every job in your organization. Such a program will eliminate the hazards of arbitrary personal opinions and habit in the determination of wage rates by:

- Defining the duties and responsibilities of each job.
- Setting up basic and consistent policies for compensation.

JOB ANALYSIS

What It Is. Job analysis is the process of determining by observation and study, pertinent information relating to the nature of a specific job. It is the determining of the tasks which comprise the job and of the skills, knowledges, abilities, and responsibilities required of the employe for the successful performance of his job. It differentiates one job from all the others.

To be useful for job evaluation, a job analysis should yield a very detailed and specific break-down of all jobs. Such an analysis should provide an organized picture of the abilities which, upon the basis of careful job study, appear to be significant in job competence. Collection of the necessary data in a systematic, orderly way not only reduces effort that might otherwise be dissipated, but it is also helpful in insuring adequate coverage and weighing of all aspects of the job.

What It Comprises. Actually, there are three parts in the analysis of any job:

1. The job must be completely and accurately identified.
2. The tasks of the job must be completely and accurately described.
3. The requirements the job makes upon the worker for successful performance must be indicated.

Job analysis can be used to determine job requirements and the specific qualities required of workers to fill jobs, for recruitment and placement purposes. Workers cannot be trained adequately unless the nature, duties, responsibilities, and like factors of the jobs for which they are being trained are known. By supplying complete information on the nature of all the jobs, it provides the basis for establishing efficient organization plans.

How to Set It Up. The first step in the analysis of jobs is an exact determination of what jobs are and their precise limits, that is, where the jobs begin and where they end.

Jobs in a refinery should be analyzed as they exist, each completed job analysis schedule describing one job as currently found in the particular firm being studied.

Contrary to popular belief, your company need not necessarily engage outside counsel to install the system referred to. All that is really essential is reasonable intelligence, objectivity, and a willingness to do the work. This means collecting complete, accurate and intelligible descriptions from the worker himself as well as from his supervisor.

The employe can do his part by filling out a questionnaire supplied by the personnel department. Such participation will help sell the job evaluation plan to the workers, who will feel greater confidence in themselves and in your management by getting a clearer grasp of their functions and duties.

In making a job analysis for job evaluation purposes, the technician should interview inferior as well as superior workers. Both can help to provide a picture of typical job duties and the kinds of information needed to perform the duties adequately. Critical areas of knowledge can also be identified by observing the characteristic differences in job performance among the most competent workers and of the least efficient.

Some companies may find it desirable to maintain a dual filing system, one set of cards for regular use in assembling job analysis information, and one set of cards as a permanent file to facilitate ready location of any particular job analysis item, whether active or inactive, on which information may be needed.

Once the questionnaire is ready for distribution to employes, the decision has to be reached as to which employes in your company will be included in the job analysis-classification plan. Should you include department heads and assistants?

It is usually desirable for a job analysis questionnaire to include pertinent points such as those which follow: Job title, number employed at time of analysis, code number, date on which analysis was made, alternative title, work performed and specific nature, experience, performance requirements, characteristics required of the worker, etc.

Preferably, the points to be covered in the job analysis-classification sheet

hould be worked out by the personel department. In fact, it is essential f pitfalls are to be avoided.

JOB EVALUATION

What It Is. Assuming that your management has adopted the procedures nd methodology to be employed in he job analysis plan, the next step is o decide how good your present nethod of determining relative base noney rates are and then to install one of the four basic job evaluation systems now in use.

Actually, job evaluation provides a working tool to appraise the employe's performance and provide information necessary to gain the highest quality and efficiency of every worker. It can bring some order out of the haphazard assigning of prevailing wage rates.

Job evaluation is not new. However, the first scientific plan for the study of jobs and wage relationships was advanced in 1881, by Frederick W. Taylor, who made time studies and analyzed jobs into units and duties. The analysis consisted largely of a listing of the steps needed for production and the time necessary for each step, so as to accumulate a standard time for the production or work performance of a single unit. Out of this practical approach arose the many incentive wage payment plans which we find in evidence today.

Employers generally favor the use and installation of job evaluation because they are assured of a relatively stable unit labor cost and greater employe efficiency. It is unfair to pay the same wage to a slow worker as to a more efficient one, and a system which rewards the individual worker according to his skill and industry based upon scientific study is therefore both more equitable and more desirable.

What It Comprises. There are four types of job evaluation systems:

1. The Ranking System. This is sometimes referred to as the card-sorting system, because the jobs are arranged from high to low, as in the cards of a playing-card deck. All the jobs are ranked in order of importance—that is, in terms of other jobs, not in terms of money, and without reference to the person holding down the job. The best method is to list the jobs in each department on a separate sheet, horizontally, and have the department heads arrange them vertically, in order of importance. The individual department lists are then combined into one organizational chart. With this type of ranking, it is essential to check and double-check with the various departments to avoid disagreement.

2. Job Classification System. Under this system, a number of categories or grades are established in advance, and the jobs are assigned to these classifications. Such a method presupposes that every job in your company contains definite elements or phases that can be classified into grades. The grades are then established on the basis of difficulty and responsibility, as represented by the number and kinds of rules regulating the work being done, and by whether or not, and how often the work is subject to check. The success of such a job-measuring stick depends on a thorough knowledge of all the jobs, so that every work element may be taken into consideration, and the duties and responsibilities of every worker clearly distinguished.

3. The Point System. This method is the most widely used today. Moreover, it is rapidly gaining still greater acceptance by American industry. Briefly, it works something like this:

A number of predetermined factors —such as age, education, years of training, experience needed, physical effort involved, etc.—are found to be common in all jobs. A schedule of points is then set up for the various gradations of each factor. Each level must be strictly defined, so that consistent interpretations of the elements included in each factor may be made. The levels or grades in each factor should be expressed or defined in written form, and it is also desirable to have each definition accompanied by examples of standard or well-defined jobs that have taken into consideration the following:

- The minimum ability which an employe brings to the job.
- Extent to which he is called upon to use his abilities.
- Responsibilities which the employer demands on the job.
- Conditions under which the job must be performed.

When the individual jobs have been evaluated the sum of the job factors should be well under the maximum total points of the system.

4. Factor Comparison System. There are several differences between this method and the point system. One is that the graded factors are assumed to be fundamental to all jobs. Another is that jobs are evaluated relatively, using certain existing jobs as points or degrees on the evaluation scale, rather than descriptive definitions.

This system has the advantages of simplicity and of establishing a fixed relationship between job value and actual compensation, since it is based on key jobs for which compensation is standard or, at any rate, not subject to controversy.

Once the key jobs have been selected, they are ranked from highest to lowest in order of importance. After the ranking, however, the key jobs are evaluated by study and examination of individual job descriptions. All other jobs are then related to the key jobs, and the final result is an agreed-upon, company-wide grading system.

The important thing to remember in any job evaluation plan is that it must not become mechanical, but should be checked periodically to determine how effectively it is being administered. This is especially true in the oil industry, where competition among firms for skilled workers is high, and where tradition and precedent are of the utmost importance in raising employe efficiency, solving wage demands and good industrial relations. —**The End**

About the Author

Robley D. Stevens is a Washington correspondent and management consultant specializing in public-labor-personnel relations. He is a former representative of the Labor department and was connected with the Army and Navy departments in civilian capacities. He has written two books on labor relations as well as a number of magazine articles in that field. Stevens holds both LL.B. and LL.D. degrees from Blackstone School of Law.

FIGURE 1—Storage area at Amon Carter Field, Fort Worth, Texas. Underground storage consists of 12-25,000 gallon tanks. Fuel travels through five main transfer lines to loading area. A pressure of 60 psi is maintained in the system at all times. When withdrawal causes the pressure to drop, pumps in the storage area automatically start. Pumps will automatically stop when the pressure returns to 60 pounds.

Pipe Lines Ease Airport Fueling Problems

Uninterrupted flow of fuel assured where direct line between refinery and airplanes is provided by pipe line.

By H. T. Brundage and **John C. Watts**
PIPE LINE INDUSTRY Staff

BOTH THE Air Force and commercial airlines are looking more and more to the pipe line industry for a dependable supply of aviation fuel. Most commercial airports as well as some military bases are located in congested areas. Transporting fuel from refineries or pipe line terminals to the fields by tank truck has become expensive and time consuming due to increased volumes of fuel required and heavy traffic on the highways.

Pipe lines terminating on the field solve this problem. By the end of 1957 the Air Force expects to have 21 Air Force bases served by pipe lines. Inability of the Air Force, or in the case of commercial fields the shipper, to guarantee long term use of the facilities has been the major deterrent to expansion of the pipe line network. Before the pipe line companies can justify the investment required to connect a field with the refinery or terminal they must know the service will be required long enough to retire the investment.

Direct Deliveries. Transporting the fuel through pipe lines does not end

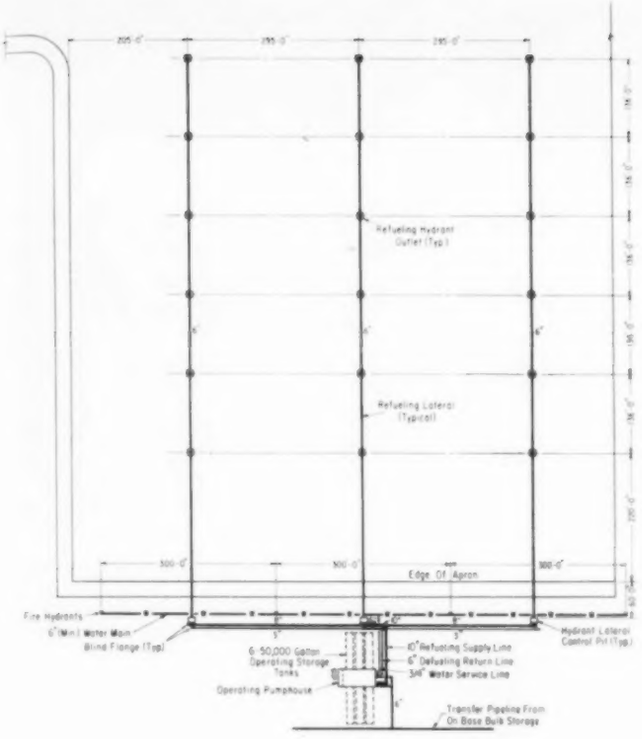

Refueling Hydrant Outlet (Typ.)
Refueling Lateral (Typical)
Edge Of Apron
Fire Hydrants
6" Min. Water Main Blind Flange (Typ.)
6-50,000 Gallon Operating Storage Tanks
Operating Pumphouse
10" Refueling Supply Line
6" Defueling Return Line
Hydrant Lateral Control Pit (Typ.)
Transfer Pipeline From On Base Bulk Storage

FIGURE 2--Tpyical lay-out of fueling system at Air Force Bases. Provision is also made for defueling the planes. Bulk storage is often supplied by direct pipe lines from the refinery or pipe line terminal

where the product is transferred by the pipe line company. At most new airports a network of pipe extends to the loading gate. Larger aircraft, traveling long non-stop hops, and consequently requiring greater fuel loads, have required revision of fueling methods. Both civilian and military airports are being confronted with this problem.

In contrast to the tri-motor transport used in the early 1930s which carried 360 gallons of gasoline in two tanks, today's four-motor planes carry 4000 gallons in eight tanks. Jet planes coming for civilian service in the near future may carry as much as 20,000 gallons.

Compounding the congestion caused by greater fuel loads, the number of planes serviced at today's busy terminals has increased. In the days of the tri-motor transport, a busy airport handled perhaps three flights per day. Today a major field will service more than 100. As an example, at New York's Idlewild airport where tank trucks are still used, a fleet of 78 trucks is required to service the planes. When you consider the other services required, such as baggage loading, catering service, and loading of the passengers themselves, there is quite a traffic jam around a departing airliner.

Relieves Congestion. One answer to the fueling problem is the use of the so-called hydrant system. Developed simultaneously by the Air Force and civilian companies, this system consists of underground pipe lines which connect a central storage area with hydrants located at the apron or loading gate. The only mobile equipment needed with this installation is a small metering cart containing filters, meters and the necessary connections to pipe the fuel from the hydrant to the aircraft. Elimination of tank trucks not only relieves congestion, but a major safety hazard is removed.

Moissant Field in New Orleans was the first civilian field with a hydrant installation. Since its installation a number of similar systems have been put in service, including San Francisco International Airport, Amon Carter Field in Fort Worth, and Lambert Field in St. Louis. An installation to serve the new terminal at Love Field in Dallas is now being tested. Among the military fields where facilities for fueling and de-fueling the planes on the flight apron are Barksdale, Smoky Hill, and Homestead Air Force bases.

Similar Design. There is little difference between the basic design used for civilian and military installations, the major differences being in the layout of the hydrants, and the number of grades of fuel required. At military fields provision is also made for defueling the planes. A grid system is usually used at a military base whereas at a commercial field the fueling would be done at the passenger loading gate.

Consider Individual Needs. No two systems are exactly alike, and design plans for new installations are under constant revision, each system being designed for the needs of the particular field. All such systems are designed to provide faster, safer, and more efficient fueling.

In all cases the system will start with a central storage area. Fuel will be delivered to tankage in the tank

FIGURE 3—Layout of the fueling system at the San Francisco International Airport. Multiple lines are necessary to maintain grade and brand segregation. Bulk storage is filled by barge.

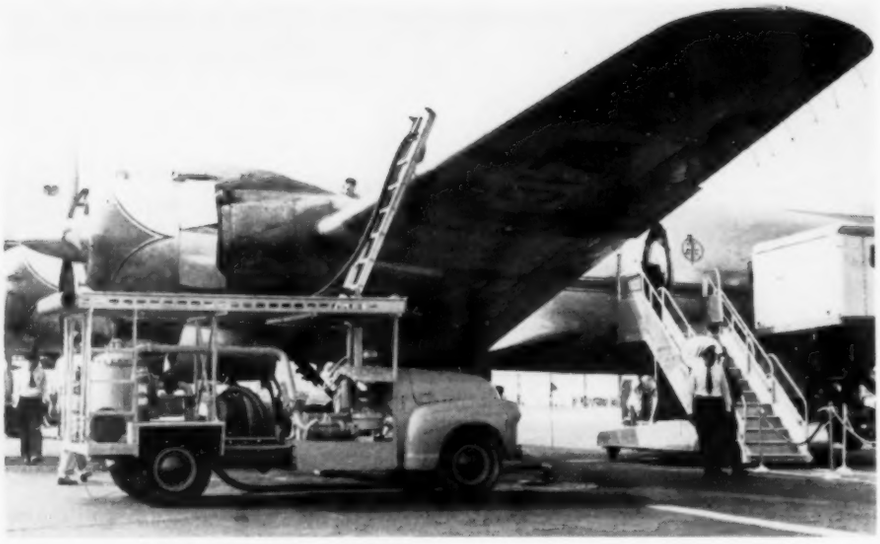


FIGURE 4—Where hydrant system is used, small metering cart replaces bulky tank trucks. In addition to servicing the planes safer and faster, much of the congestion around departing planes is relieved. Carts contain meters, filters and hose.

FIGURE 5—Fueling hose is equipped with quick-coupling valve. This valve is designed to prevent spillage when hose is connected or disconnected.

farm in one of four ways: pipe line, barge, tank truck, or railroad tank car. The present trend is to provide direct pipe line service wherever possible. In addition to the bulk storage area, which is usually in a remote location from the fueling areas, an intermediate or satellite storage area near the loading area is usually included. Transfer pipe lines fill the satellite storage from the bulk terminal. From this area, laterals carry the fuel to the hydrants at the loading area.

Grid Layout for AFB. A typical military installation is shown in Figure 2. In this system there are three laterals, each with 6 hydrants, enabling 18 planes arranged in an apron pattern to be fueled or defueled. Under present circumstances, only one plane can be serviced at a time on each of the three laterals. If larger diameter pipe were used, and certain modifications of the electrical control system were effected, all 18 planes can be serviced at once.

Separators at Storage. The central pump station, located at the satellite storage area, is equipped with six deep well 30-horsepower pumps, each with a capacity of 300 gallons per minute. Six underground 50,000-gallon tanks are supplied from bulk storage by eight and ten-inch lines. In addition, the pump station includes six 300 gpm jet fuel-water separators. Careful testing of the separators insures a maximum allowable of 0.01 percent water in jet fuel distribution system. Flow valves regulate the rate of flow through each separator and will automatically shut down the unit should a slug of water enter it.

Fueling or Defueling Possible. Each of the three laterals, which terminate in a control pit, is connected to the pump house via 8-inch lines. The refueling valve, connected to the 6-inch lateral, is solenoid controlled. The defueling and pressure regulating valve is located on a 3-inch bypass line a few feet downstream from the refueling valve.

Located about 3 inches below the pavement surface, hydrants are installed in a gradually sloping mound rising to an approximate maximum of 3 inches above the airstrip surface, allowing surface water to drain away from the hydrants. A liquid level control valve maintains the level of the fuel at about 18 inches below the hydrant outlet preventing large quantities of air being pumped into the aircraft.

Cart Portable. A metering cart containing filtering and metering equipment is placed between the hydrant and the airplane. A pressure-regulating valve limits the fueling rate to 600 gallons per minute. The cart is also equipped with a surge chamber. When empty, the metering cart may be moved by one man.

Multiple Lines Required. Besides the difference in spacing of the hydrants at civilian fields, fuel must be segregated as to grade, and brand. Whereas only one lateral is needed to each fueling position on a military field, as many as five separate systems may be required to each location on a commercial field.

Typical Civilian System. A typical system for a commercial field is in use at the San Francisco International Airport (Figure 3). This installation includes a bulk storage area consisting of storage capacity for approximately 3500 barrels. Fuel is received at the bulk tank farm from barges. The satellite storage area is supplied through two 9000 foot lines. A 20-hp and a 15-hp pump, each with 150 gpm capacity, located in the bulk storage area but controlled from the satellite area, serve the two transfer lines. Adequate safety devices have been incorporated

FIGURE 6—Hose coupling is connected to hydrant which is recessed in parking apron. When connection is made, the valve opens applying pressure to cart. Two hydrants are provided at each loading; one under each wing of the plane.

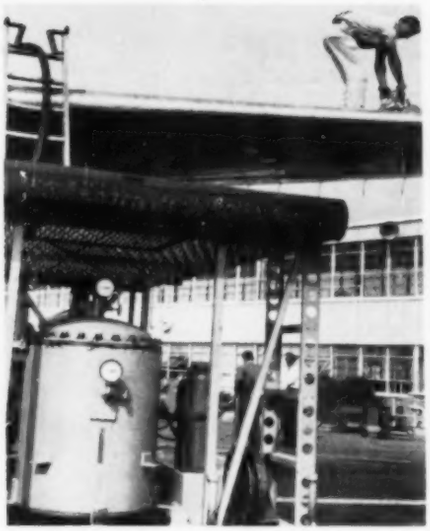


FIGURE 7—Hand operated nozzle feeds the fuel to the aircraft. Modern planes have four tanks, two in each wing. To speed the fueling operation, two carts will be used to fuel each plane, one for each wing. Hydrants are provided under each wing of the plane.

FIGURE 8—Fuel is metered as it passes through the cart. A ticket will be printed by the meter after fueling is completed. The airline will be billed for this amount.

to accurately and safely transfer products between storage areas.

Controls at Storage. At San Francisco, satellite storage facilities are located approximately 1600 feet northwest of the new airport terminal building. Equipment in this area consists of eight 25,000 gallon buried storage tanks, eight 40-hp, 400-gpm pumps, eight 400-gpm combination water separators and micronic filters, tank truck loading rack and meter testing equipment. All satellite storage tanks are equipped with high level float controls that automatically close off the tank inlet valve when the tank is full to prevent over-filling the tanks.

The concrete pit in which the satellite tanks are located drains to a sump which is automatically pumped into an oil-water separator which separates any petroleum from the water passing into the sewer line.

Hydrants at Each Concourse. Product is pumped from the satellite storage tanks to plane fueling position through five main pipe lines consisting of 6-inch, 8-inch and 10-inch pipe. Four-inch and 6-inch lines are connected to the main lines on each side of the three concourses. Four-inch lines run from the branch lines to two sets of hydrants at each fueling position. There is one set of hydrants under each wing of a plane when the plane is parked at a concourse gate position.

Operation Automatic. Operation of the system from the satellite storage to the hydrants is automatic. When fuel is desired the metering cart is connected to the underground hydrant and the start button near the hydrant pushed, starting one pump. After the hose is disconnected, the pump will bypass for three minutes and then automatically stop. Special valves for both hose and hydrants prevent any spillage of product when connecting or disconnecting the hose.

One pump will provide enough product for two carts. If another is connected, the line pressure will drop automatically starting a second pump. With two pumps operating, 800 gpm will be provided which is enough to supply full capacity for four fueling carts. A maximum of six carts can be in use at a time which will require all three pumps in operation at the storage area. As fueling carts are disconnected from the system, fuel requirements drop, pressure in the system will rise, and pumps will automatically be turned off in rotation.

Carts Contain Meter. The fueling carts, which can be either hand drawn, or motor propelled, are equipped with a micronic filter, a surge chamber, a meter and automatic water detection device. If a slug of water is pumped through the cart, the device will immediately close a valve stopping all flow through the cart. Flow will not resume until all water is removed. A push button on top of the ladder, or a second button located on the cart will also close the emergency valve in case of trouble between the cart and the plane. Pressure to the carts is controlled to provide a maximum of 50 pounds per square inch at the cart.

Hydrant System Efficient. While the hydrant system may not be the final solution to the congestion created during the fueling of aircraft, it has proven a step in the right direction. Use of the portable metering carts removes bulky equipment from the loading area. At one new airport eight carts serve 36 parking positions. Since much of the pumping and metering equipment is either centrally located, or mounted on a few carts, equipment costs are much less for this type system.

Hydrant systems at civilian fields are not operated by the terminal management. Usually they are designed, installed and operated either by an oil company, or a service company specializing in the field.

When incorporated with a pipe line which connects the storage area to a refinery or products terminal, the hydrant system of fueling will assure a smooth flow of fuel directly to the loading gate. —**The End**

Good Writing is Easy

Improve your engineering articles and technical reports with these simple "rules-of-thumb" used by professional writers.

By John L. Kent
Consolidated Electrodynamics Corporation, Pasadena, Calif.

EDITORS COMPLAIN that engineers don't know how to write for their readers. Research directors and other company administrators complain that their engineers write poor reports.

Yet, technical writing can be improved easily. Special courses at industrial firms and in government laboratories have proved that.

The engineer's inability is chiefly due to a lack of knowledge. Unfortunately, this knowledge is not readily available. Refresher courses are few, and the several textbooks are long on theory and short on practical help.

Engineers' training and experience help them become good writers faster, but at the same time throw a number of hazards in their paths.

First of all, because they are used to doing things systematically, engineers do not have too much trouble organizing their written presentation. On the other hand, because they are detailists, they often include all the details, failing to weigh their relative importance for the purpose of the report or article.

Engineers deal with facts and things. They therefore find it easy to write their reports and articles unemotionally and without bias. But because of this objectivity, they also find it difficult to engage in the "light touch" that is often necessary to explain difficult passages.

Learn the "Professional" Touch. Generally, the engineer-writer succeeds almost directly in proportion to his adoption of methods used by professional writers.

The professional writer—the man who earns his bread by his writing skill—must have somehow acquired techniques which serve his purpose. And, of course, he has. These methods are adaptable to technical writing. They can be summed up under four headings:

1. Plan and outline.
2. Consider the reader.
3. Use short sentences and simple words.
4. Be critical.

Planning Is the First Key. The first, and most important key is proper planning. Whether it's an article, report or other technical manuscript, an outline and a period of planning are necessary. Write an outline.

Every type of writing has its own outline—its writing format.

A report, for example, is a specialized form of expository writing whose order should be apparent through section headings, sub-headings, numbered paragraphs and other means.

An article, too, has a form. It is not a cutdown report. It's a distinct piece of writing.

A technical article does not have to be as complete and as detailed as a report. You can omit details of minor importance. This "selective omission" is one of the major differences between the report and the article. A technical article will have a more general audience which will include many "non-specialists." This means that you will have to broaden your appeals somewhat.

The detailed planning should not be hurried. Professional writers point out that after making an outline, the writer should temporarily forget about

Checklist for Technical Reports

Experienced writers have learned that they could find errors and flaws in their writing and presentation only by using a checklist and systematically going through their manuscript several times. Here is one for checking reports.

1. First consider the report as a whole
- a. Are the various parts labeled properly?
- b. Is there evidence of orderly presentation?
- c. Does report tell a story?

2. Introduction
- a. Does introduction agree with other parts of report?
- b. Have you told reader what you will tell him in report?

3. Body of report
- a. Have you described methods or operations completely?
- b. Are details clear enough so another person can reproduce work?

4. Check conclusions and recommendations
- a. Do they answer the problem posed in introduction?
- b. Are recommendations clear? Do they avoid hedging?

5. Composition
- a. Have you clearly marked transitions from one topic to another?
- b. Check paragraphing.
- c. Check sentence structure.
- d. Check words. Strike out and substitute better ones where needed.

6. Grammar
- a. Look for split verbs, poorly placed adverbs.
- b. Check "and" and substitute better conjunction where possible.

7. Read report again
- a. Are there any weak spots which are not clear?
- b. Consider the reader. Will he understand everything you said?

he writing and go on to something lse. It is important that you do not rite the report or article after your ind is apparently primed for it.

A lapse of even a few hours will elp produce better written work. During this unproductive time, your ubconscious will be working on the rticle or report. Finally, when you sit down to write, you will find it much asier than you anticipated.

Consider the Reader. The second key to technical writing improvement is to consider the reader. To write well, you must consider your typical reader and write for him.

Who is your typical reader? It is probably another engineer or some technically trained person. This type of person possesses certain characteristics.

First of all, he is a serious person who is reading your material solely to get information. He is not interested in being entertained. A trade journal editor knows this, so in an article you submit he cuts any cute openings or obscure analogies you might have dreamed up.

Because of his education and experience, the technical reader is orderly and neat. He thinks more logically than most of us. Thus he wants to see some semblance of order in your presentation. You can please him by stating your information in some logical manner—chronological, for example. Or, proceeding from the general to the particular. In a report this order is apparent through use of section and subsection headings.

Lastly, your reader is a busy man. In most industrial fields the engineer is pacing progress. So you must use the least amount of his time to tell your story. The editor knows this too, and he acts accordingly. If you haven't taken the engineer's time into consideration, he will. And your story will be cut.

So these are the things you must do:

1. Write for a specific audience—Unless you keep your typical reader in mind as you write, you will not write at the proper level. In engineering writing the tendency is to assume a greater stock of knowledge than the typical reader possesses.

2. Give reader information — He wants to read solely for information. Not for entertainment. Not to kill time.

3. Tell your story quickly — Give him summary-type reports. Write articles with newspaper-style leads. Don't dramatize — summarize. Don't expand—condense.

4. Make your story easy to read—Two easy ways of making your story easy to read: Use short words. Use short sentences.

5. Be clear, concise—Clear writing can be obtained chiefly through simplicity and precision. Keep thoughts (and resulting sentences) simple. Conciseness can be obtained by planning and outlining and by the use of simple grammatical construction.

6. See it from reader's viewpoint—Who cares what you think! It's your reader, not you, who is important. Look at your story from his self-interest.

Use Short Sentences. One of the major "tricks of the trade" of the professional writer is his use of short sentences. The professional writer also uses the short word in preference to the long one.

The short sentence is probably the greatest help to understandable writing. It permits spacing of ideas.

As sentences become longer, relationships between words become less clear. Such sentences are harder to understand and may require rereading. They often lead to errors in grammar.

There's another reason why technical people in particular should write short sentences. In ordinary writing, shorter words can be substituted to help the reader understand. Generally, technical words cannot be simplified. Short sentences can compensate for this limitation.

When average length of sentences runs over 20 words, thoughts become difficult to understand.

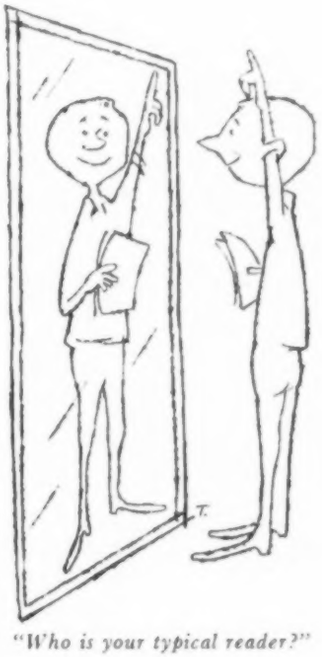
A sentence of over 25 words generally can be put into two short ones. After several long sentences, insert a short one to act as a "rest" for the reader's mind.

Be Critical. Being critical of our writing is the fourth key to good presentation. This involves more than a mere reading over and insertion of a comma or the substitution of a better word. It should be a systematic check of the manuscript.

After you have written your first draft, read it over several times to get the feel of it. Are you telling a story? Simply? Concisely?

Read it over again, with a good

"The detailed planning should not be hurried."



"Who is your typical reader?"

"Be critical."

dictionary at hand, and look for bad sentences, lack of topic sentences and errors in grammar. If time permits put the manuscript out of sight for a day or two. Then read it over again before letting it out of your hands as finished writing.

Examinations of engineers' writing reveals several failings which are repeated over and over. These include failure to paragraph, use of jargon and cliches, wordiness, and lack of "sell."

The first sentence of a good paragraph should be the topic sentence. It should tell the reader what's going to be said in the paragraph. It should also provide a transition (if such is needed) from the preceding paragraph. This topic sentence should be short and direct.

You Must "Sell" Your Story. The lack of "sell"—the ability to "put over" a story — is evident in both articles and reports. Many articles in trade journals are uninspired and uninspiring.

To get good presentation you must not only get facts down briefly, but so arrange them that the reader can sense that back of the arrangement and presentation was an engineer who knew what he was talking about.

Directness, simplicity and enthusiasm help put over articles, reports and bulletins. People respect a man who knows where he is going. This is also true for a piece of writing.

About the Author

John L. Kent is chief of the Editorial Bureau of Consolidated Electrodynamics Corporation, Pasadena, Calif. During his career he has been a government information officer, trade journal editor, and company periodical and manual writer and editor.

Kent is president of the Technical Writing Improvement Society, and is a member of the American Association for the Advancement of Science, and other professional groups.

If Oil Could Speak

If oil could speak it would have many fascinating truths to tell the non-oil public—truths that would win thousands of new friends for the oil industry.

But, oil can't speak—you can. You, as an individual, can win many new friends for the oil industry if you will pass the true facts on to your non-oil industry friends.

Here are some of those true facts. They are being presented for one purpose: To keep you posted on your industry, so you can tell the story oil is unable to relate.

Read these facts. You will find them informative—and interesting.

"If Oil Could Speak" it would tell the American public:

What Does the Oil Industry Do With the Consumer's Dollar?

Much of the industry's income is plowed back into finding and developing new oil reserves. An average of eight wells was drilled for each million dollars of petroleum production income during the past year. In North Dakota alone, oil companies have invested more than 200 million dollars searching for and producing oil.

How Much Gasoline Are We Using?

Every second of the day, more than 1772 gallons of gasoline were burned last year by the nations' gasoline-powered vehicles. Taking the lead in the consumption of this record-breaking 56 billion gallons of fuel was California, with 5⅓ billion gallons. Texas followed with 4½ billion gallons, New York with 3⅔ billion, and Ohio with just over 3 billion gallons. Maintaining adequate supplies of gasoline is an ever-present challenge to oil men who continue to break their own records for filling America's oil needs.

Do "Big" Companies Control the Oil Industry?

Definitely not. To give but one example, of all wells completed last year, more than 78 percent were owned and financed by small companies or independent operators.

What Is Being Done to Insure Future Supply?

Some of the wealth that assures America's future prosperity is being "Banked" underground—at a cost of millions of dollars to the oil industry. One Texas company has begun storing its supplies in a depleted gas field—the deepest underground storage project in the world today. Up to 30 billion cubic feet of gas will be banked for consumer's convenience at depths of more than 8000 feet. Underground storage figures among the most modern methods used by ingenious oil men to establish and maintain vital supplies of oil products for the nation.

Is the Oil Industry a Good Employer?

According to the Bureau of Labor Statistics, the average hourly earnings for workers in petroleum refining last year was $2.46, compared with $1.88 for workers in all other manufacturing industries!

What Is Being Done to Upgrade Oil Product Quality?

More than 65 percent of the $450 million spent by refiners last year for new refining capacity went to improve the quality of gasolines, home heating oils and other petroleum products.

TRENCHING MOVES FAST

When Bucyrus-Eries Move In

Trenching for a 24-in. natural gas pipeline in northern Pennsylvania near Honesdale is this Bucyrus-Erie 22-B dragshovel. The high pace this machine has set for its owner, Oklahoma Pipeline Constructors, Dallas, Tex., is characteristic of the features that have made Bucyrus-Erie dragshovels outstanding.

There's high speed on the hoist and swing as well as full digging power for heaped, quick-filling loads. The cambered boom provides added clearance for digging deep trenches, makes dumping easy because dipper can be raised high and brought in close without spilling the load. The dipper has sloping sides and extended lip area for clean loading and dumping.

Tractor-type crawler mounting is available, too, for top mobility. It raises ground clearance enough to travel over rocks, stumps, and most other obstructions. Deep grousers on the tractor-type treads provide sure traction in soft ground and permit the machine to climb steep grades. Special seals protect track-roller bearings against damage from water, dirt, and grime.

For more information on the high-output features of Bucyrus-Erie ½-yd. 15-B, ¾-yd. 22-B (both available with tractor-type crawlers), and new 1-yd. 30-B dragshovels, see your Bucyrus-Erie distributor today. 384E57

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin

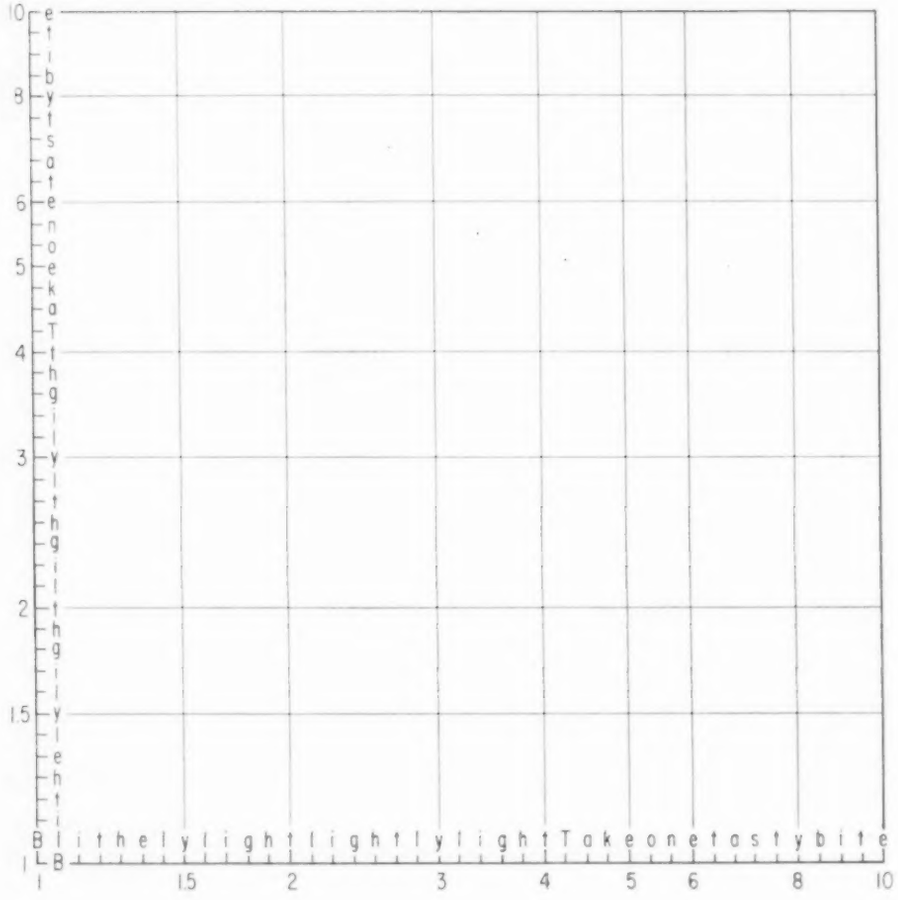
Rules of Thumb

and Engineering Data Sheets for the Pipeliner's field notebook

$25 for Engineering Data Sheet $15 for Rule of Thumb

These practical aids give quick, reasonably accurate answers to design, maintenance and cost estimating problems. PIPE LINE INDUSTRY will pay $25 for each chart, nomograph or data sheet published—$15 for each Rule of Thumb. Send your ideas to PIPE LINE INDUSTRY, P. O. Box 2608, Houston, Texas

Miscellaneous **—35—"Mosquito" Method Makes Log Paper**



Every engineer, at some time or other, has the need for a piece of logarithmic paper with nothing available but natural scale paper.

Logarithmic paper can be constructed from natural-scale paper without the use of tables of logarithms by means of the following "mosquito" method. Merely keep in mind the little rhyme:

Blithely light, lightly light;
Take one tasty bite.

Horizontally and vertically from the origin on natural-scale paper write out the rhyme, omitting spacing and punctuation, with one letter to a division as shown in the figure. Mark successively the numbers 1.5, 2, 3, 4, 5, 6, 8, and 10 at the last letters of the words. Then draw the horizontal and vertical rulings to complete construction of the logarithmic paper. This approximation is good to about one-third of 1 percent.

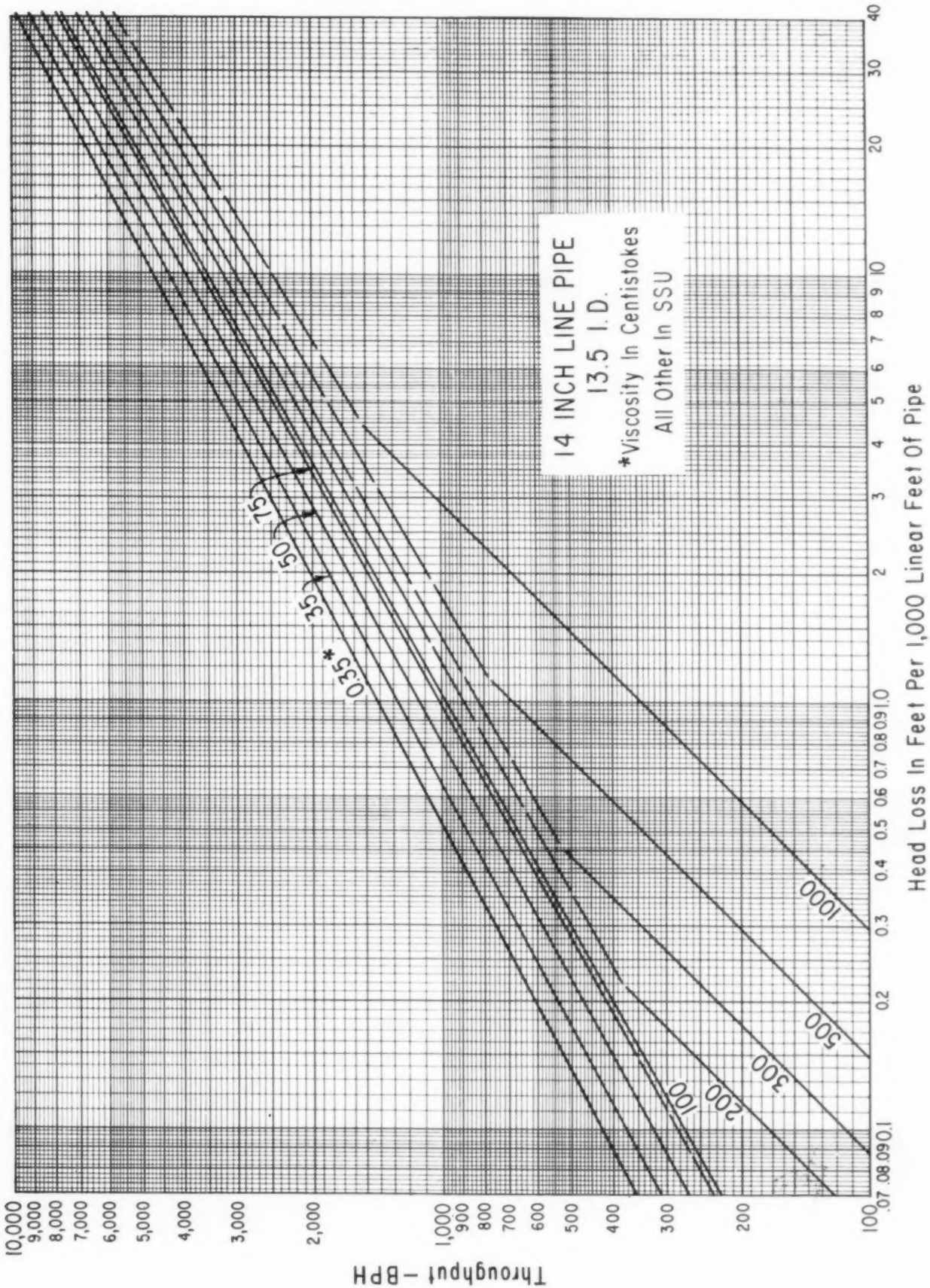
Engineering Design **—39—Head Loss**

Charts for Various Sizes of Pipe

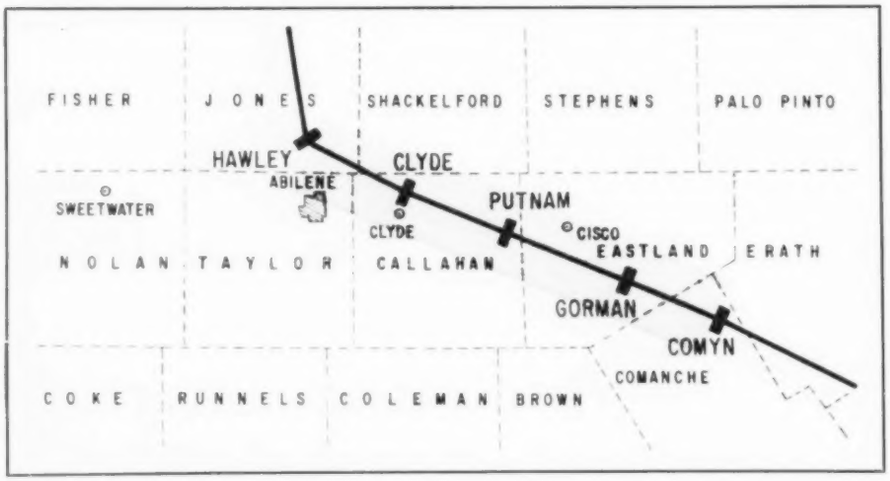
Friction Loss Characteristics for 14-inch pipe were computed by a pipe line company using data of the Hydraulic Institute. Use of this data in laminar and critical zones is adequate for estimates. Friction losses in transition and complete turbulent zones are very accurate.

(Chart 6 in a series of 19—14-inch line pipe)

ENGINEERING DESIGN 39



IN PIPE LINE CONSTRUCTION



Humble to Add 90 Miles To Panhandle-Gulf System

Humble Pipe Line Company recently announced plans to build a major $3.5 million addition to its trunk system which connects the Texas Panhandle with the Gulf of Mexico.

The plans call for construction early in 1958 of a new 16-inch crude oil pipe line, 90 miles long, between Hawley, in Jones County, and Comyn, in Comanche County, Texas. This line will eliminate the need for intermediate booster stations between Hawley and Comyn.

The new line will have a maximum capacity of 99,000 barrels a day. It will replace the present ten-inch system between these two stations, which has a maximum capacity of 62,000 barrels a day. Current throughput on the present Hawley-to-Comyn line is 58,500 barrels a day.

Survey work and purchase of right-of-way for the project will get under way immediately, Humble officials said. Actual construction is expected to start next February.

Humble's trunk system from the Texas Panhandle is the only pipe line outlet direct to the Gulf area for this crude. It is also one of the company's main arteries to the Gulf area for West Central Texas crude. The new line will connect out of Comyn with facilities of other companies and with Humble's own multiple-line system which extends to Satsuma and Baytown by way of Hearne.

Another part of the project, Humble officials said, will be to convert Hawley from a diesel-engine plunger-pump station to an electric-motor centrifugal-pump station.

When the new line is completed, the present ten-inch line will be taken up for use elsewhere. The three booster stations on the old line at Clyde, Putnam, and Gorman will also be dismantled, but an injection point will continue at Clyde.

The existing line passes through the Fort Phantom Hill reservoir, the water supply for the city of Abilene. The new line will be routed around this reservoir as well as around a proposed lake to be created by Proctor Dam near Comyn.

Fish Engineering to Build New Houston Headquarters

Construction will begin in 1958 on the new Houston headquarters of Fish Engineering Corporation.

Ray C. Fish, board chairman of Fish Engineering and associated companies, said that the new building will represent an investment of over $1 million and will accommodate all of the varied activities of the Fish group of companies. Fish Engineering, Fish Northwest Constructors and Fish Service Corporation will occupy most of the new space, but facilities will also be provided for Fish Petroleum, Inc., Continental Marine Exploration Company and Arnold Pipe Rentals Company, Inc.

The Fish companies presently occupy several floors in the M & M Building, Houston, where the engineering firm began operations shortly after World War II.

TGT Gets FPC Authority For 897 Miles of Pipe

Tennessee Gas Transmission Company of Houston has been granted temporary Federal Power Commission authorization for the construction of 897 miles of natural gas pipe line and 66,990 horsepower in compressor capacity at an estimated cost of over $129 million.

The construction incudes 556 miles of 30 inch line from the Louisiana Delta to Portland, Tenn., and 341 miles of 24, 26 and 30-inch pipe paralleling its existing system. The new facilities will be located in Louisiana, Mississippi, Tennessee, Kentucky, West Virginia, Pennsylvania and New York.

Authorization, which does not permit operation of the proposed new facilities, will provide Tennessee with an increase of more than 287 Mmcf of natural gas per day in the capacity of its pipe line system.

Williams Bros. to Lay Largest Gas Pipe Lines

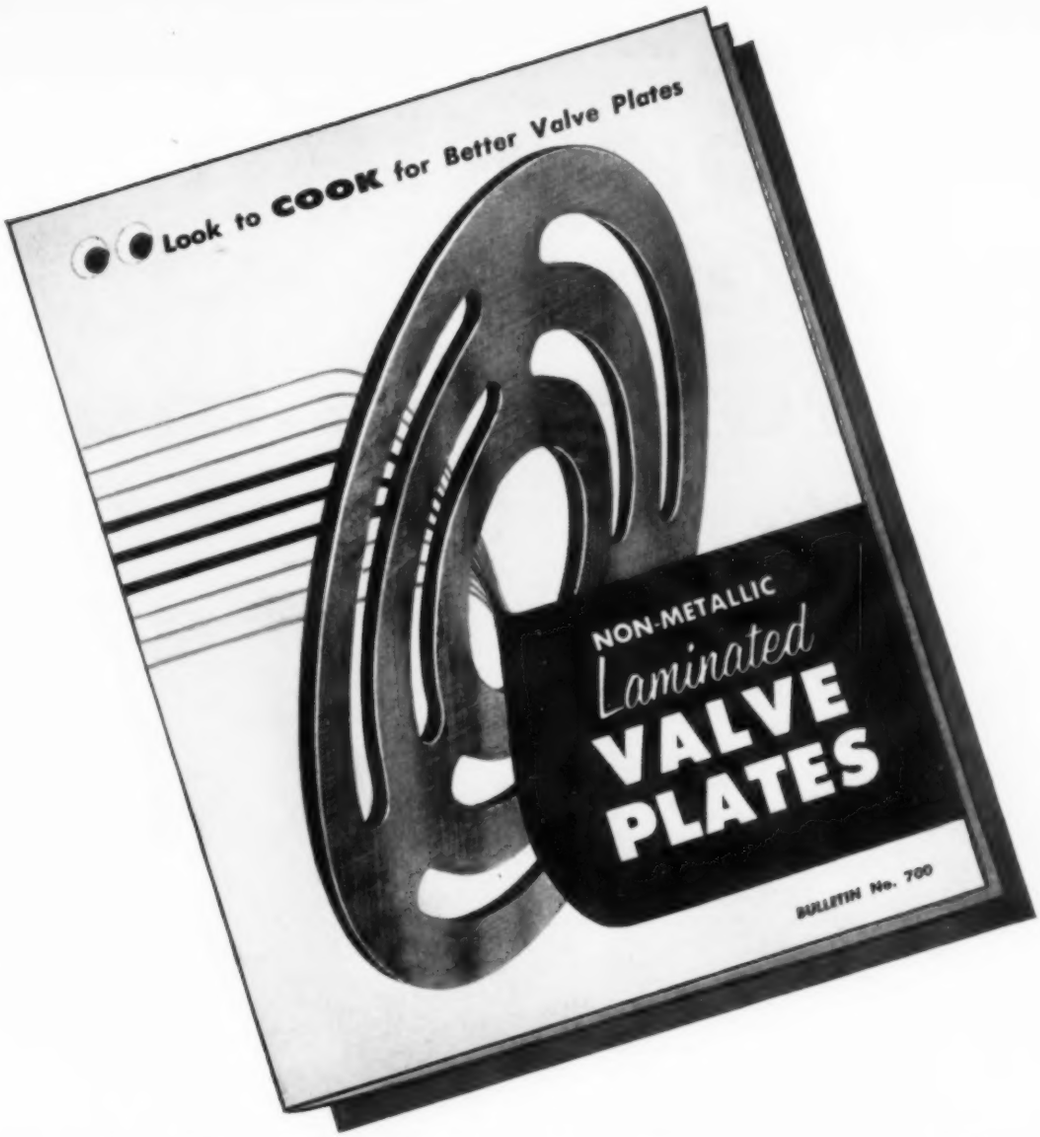
A construction contract for what may be the largest gas pipe lines ever built to provide coke-oven gas to six plants in the Pittsburgh, Penn., area has been let to Williams Brothers.

The lines are being constructed for Carnegie Natural Gas Company, a U. S. Steel subsidiary. They will have a diameter of 55⅜ inches for the first 8½ miles of their 13 mile-length, and 43¼ inches for the remainder. Pipe laying is expected to start in May and be completed November, 1958.

Although pipe up to 80 inches has been used by the Army for water lines, it is believed that pipe of the size to be used on the Carnegie project is the largest used for gas transmission lines.

The American Bridge Division of U. S. Steel is making new rolls to fabricate the pipe, and special hydraulic lineup clamps have been developed for use in construction.

The lines will transmit 255,000 Mcf of gas per day at 15 psig.



Send for this informative new bulletin today!

Cook Bulletin No. 700, *"Non-Metallic Laminated Valve Plates"* is now off the press. It contains up-to-date facts on the when, why and where of non-metallic valve plates — plus helpful data on applications, delivery and special materials. It also explains how Cook laminated valve plates are different from competitive brands, and *why* they are better.

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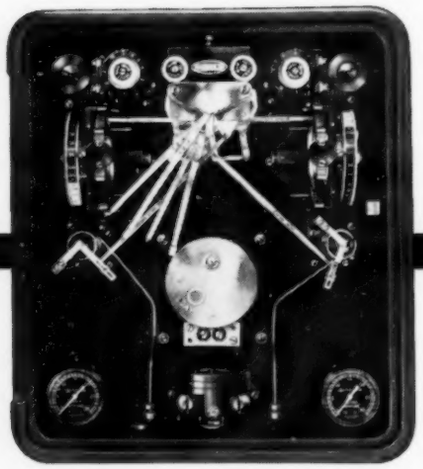
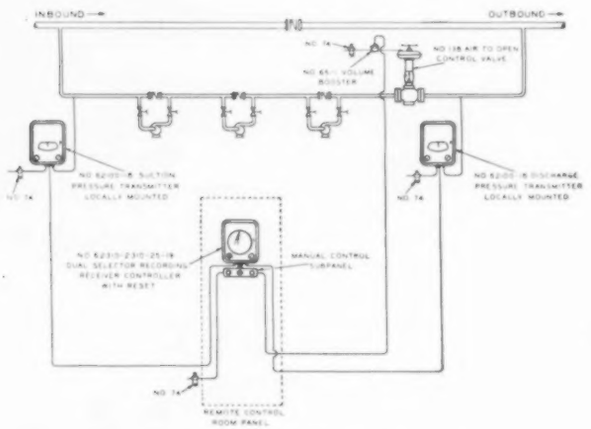
Masoneilan Pipe Line Control Instruments and Systems



Masoneilan 10000 Series Control Valves, in conjunction with Valve mounted Model 2707 Controller, are widely used for pressure control on take-off lines.

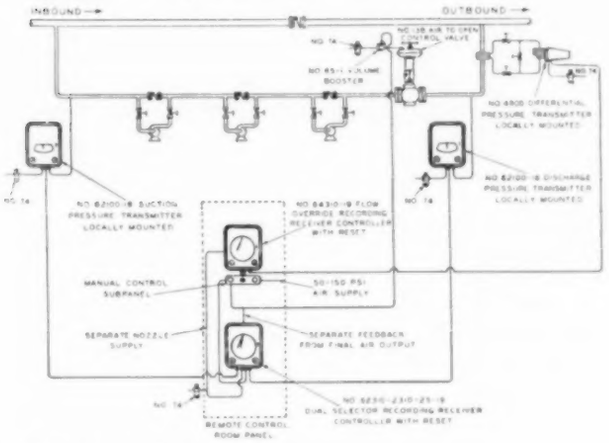
Masoneilan Dual Selector Controllers are modern instruments designed for applications where two related variables may be controlled within pre-selected limits by a single valve.



This typical system shows use of the Dual Selector Controller with suction-discharge pressure control.

Typical Masoneilan equipped control room on the Southern Pacific petroleum products pipe line. All pumping and take-off stations on this system are completely equipped with Masoneilan controls.

Series 4800 Differential Pressure Transmitters are precise instruments for measuring differential pressure and flow. These force-balance transmitters convert a measured differential pressure into a proportional pneumatic output pressure (3-15 psi) which is transmitted to an indicating, recording and/or controlling receiver.



This typical system shows use of the transmitter with suction-discharge pressure control and flow override.

Mason-Neilan engineers are available to work with you on your pipe line control problems. Write today for complete data on Masoneilan equipment.

MASON-NEILAN

Division of Worthington Corporation

51 NAHATAN STREET, NORWOOD, MASS.

SEVENTY-FIFTH 75 ANNIVERSARY

Sales Offices or Distributors in the Following Cities:

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Appleton • Birmingham • New Orleans • Seattle • Jacksonville
Wilmington • Mason-Neilan Regulator Co., Ltd., Montreal & Toronto

El Paso Receives Temporary Okay For $922,000 Facilities in Texas

El Paso Natural Gas Company of El Paso, Texas has received temporary Federal Power Commission authorization to construct and operate natural gas facilities in Howard and Borden Counties, Texas.

The construction includes 18.1 miles of 12¾ inch loop pipe line between Good Field in Borden County and the East Vealmoor gasoline plant in Howard County. The incomplete authorization also will affect the addition of 810 compressor horsepower to Vealmoor station, dehydration capacity addition amounting to 19 Mmcf per day to Vealmoor plant and the construction of additional purchase meter facilities.

Cost of the new facilities will be approximately $922,000.

El Paso will use the facilities to receive additional volumes of residue gas from Reef Fields Gasoline Corporation and Skelly Oil Company at the East Vealmoor plant.

In a later action the FPC authorized El Paso's construction of small installations to attach new supplies of gas from independent producers in the general area of the firm's existing transmission system in Texas, New Mexico and Arizona. The field lateral lines, to range in size from 4½ to 20 inches in diameter, will not exceed $500,000 in single project, and the aggregate cost will not exceed $1.5 million. The authorization included the construction of purification and dehydration facilities, with each single installation to cost not more than $500,000, and an aggregate cost of not more than $1 million; and additions and alterations to existing gasoline plants, each installation to cost not more than $500,000 and the aggregate cost not to exceed $1 million.

Kerr-McGee Buys 1100 Miles Of Gulf Refining's System

Kerr-McGee Oil Industries, Inc., is buying the 1100 miles of Gulf Refining Company's crude oil pipe line gathering system in Oklahoma.

The transaction will become effective January 1, 1958. The gathering system is confined mainly to eastern Oklahoma, serving such fields as Seminole, Glenn pool and Drumright. The sale of the Oklahoma gathering system will not affect Gulf's exploration, production and marketing in Oklahoma, Gulf Oil officials say.

Kerr-McGee has indicated it plans to continue to purchase oil from leases connected to facilities covered by the sale.

215-Mile Crude Line Planned for Bolivia

Construction is expected to start in March on a 215-mile crude pipe line to be built by Williams Brothers Sudamericana, Ltd., under a contract signed with Yacimientos Petroliferos Fiscales Bolivianos, the Bolivian government's oil corporation, to give Bolivia its first outlet to the sea for its crude production.

The line will run from the interior of Bolivia to the Chilean port of Arica and is the fourth phase of a pipe line network being built by Williams Brothers in Bolivia.

The new sections will consist of 171 miles of ten-inch and 44 miles of eight-inch joining the existing line at Sicasica and carrying crude to Arica.

New York State Gets Okay For $1.2 Million Gas Lines

New York State Natural Gas Corporation of Pittsburgh, Penn. has obtained Federal Power Commission authorization for the construction and operation of natural gas pipe line facilities in New York State to cost $1,211,000.

The authorization covers a new 3000 horsepower compressor station on the company's system near Utica, N. Y., and nine miles of 12-inch branch line extending from an existing line to Oneida, N. Y., with a measuring and regulating station at Oneida to make increased deliveries to Niagara Mohawk Power Corporation of Syracuse, N. Y., for distribution in the areas of Syracuse, Oneida, Rome and Utica. The project also includes a measuring and regulating station at East Greenbush, N. Y.

Pipe Line Contractors Sponsor Welding School

A welding school will be held at Kilgore, Texas, beginning January 13, 1958 in an attempt to overcome the shortage of qualified pipe line welders.

Sponsored by the Pipe Line Contractors Association and the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industries of the United States and Canada, the school will be operated by the Extension Service of The University of Texas and the Industrial Education Department of Kilgore College. Instructors will be furnished by PLCA.

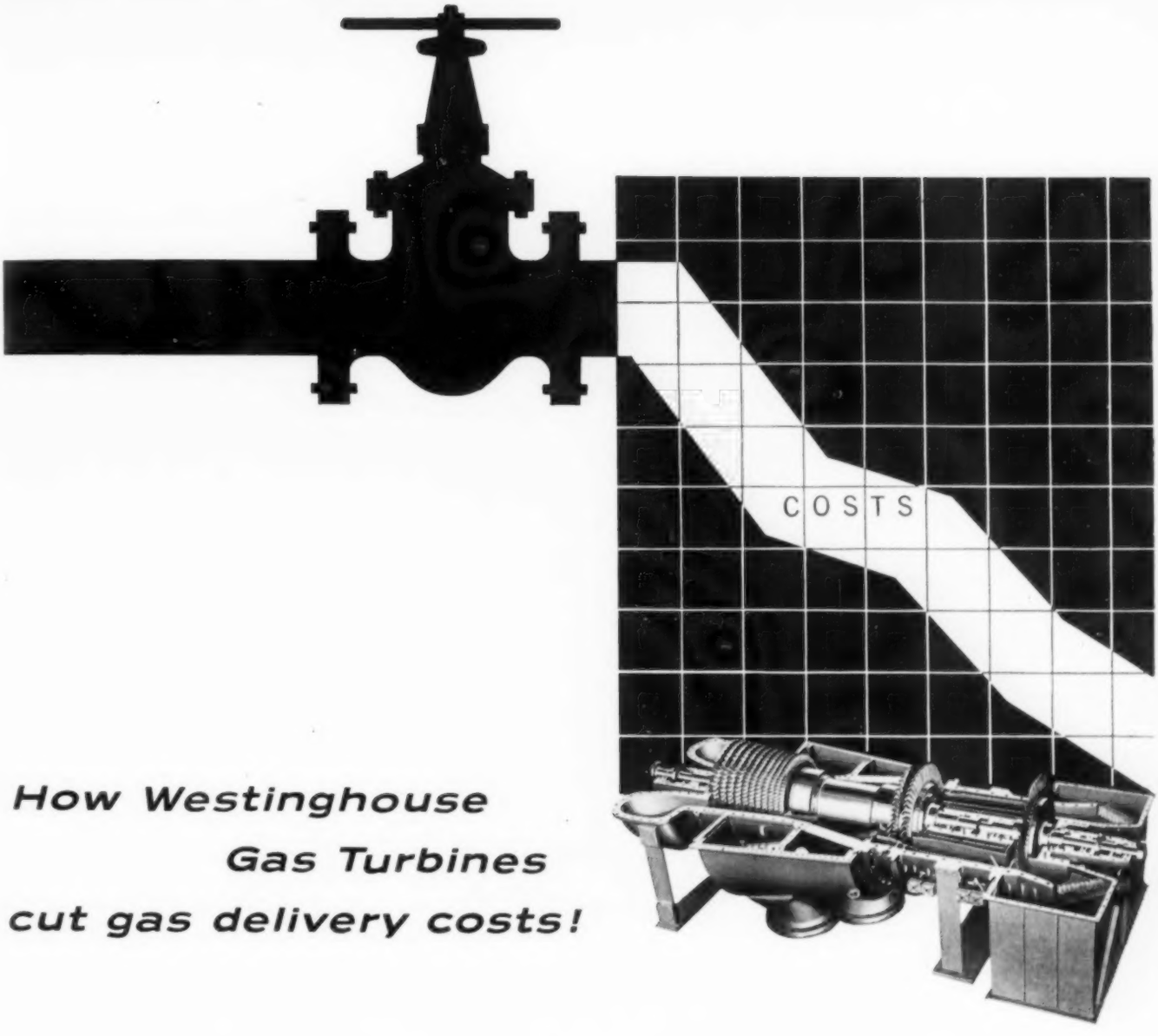
From 240 to 288 hours of instruction will be offered to trainees who will be carefully screened as to fitness for the occupation of pipe line welder. Each man will attend eight hours daily, six days per week, for from five to six weeks. Classes will be limited to 24 trainees. Length of the course will depend on the abilities of each individual trainee.

Applicants must be recommended by a member of the Pipe Line Contractors Association. The list furnished the advisory committee by the contractors will be screened by the committee who will select the trainees. Serving on the advisory committee are B. E. Barnes, Williams Bros. Co., Tulsa; Walter Nolan, Sheehan Pipe Line Construction Corp., Tulsa; Robert K. Shivel, H. C. Price Co., Bartlesville; Charles C. Balch, United Association, Tulsa, and R. A. Gump, Pipe Line Contractors Association, Dallas.

Gas to Be Available In Toronto-Montreal

Natural gas will be available for service during the coming winter to all municipalities on the Toronto-Montreal section of Trans-Canada Pipe Lines' transmission system, including the city of Montreal.

Officials of Trans-Canada and Union Gas have announced that arrangements have been completed for a supply of gas to be borrowed from the Union Gas Company for the Eastern Canada section of the pipe line's market until Alberta gas arrives. Trans-Canada will return the full amount of gas borrowed from Union beginning next fall when Alberta gas moves east.



How Westinghouse Gas Turbines cut gas delivery costs!

EACH MONTH, MORE WESTINGHOUSE gas turbines are being installed for gas transmission. These orders indicate it's time to take another look at the savings offered by the modern Westinghouse gas turbine for pipeline pumping! Here's what you get:

Extra hp during cold weather—Up to 25% more horsepower . . . when you need it most!

Lower initial cost—based on unit horsepower, not considering the extra 25% during cold weather. And, usually, no reduction gear is needed.

Lower station structure cost—The gas turbine weight is less than 45 pounds per hp and the vibration level is low.

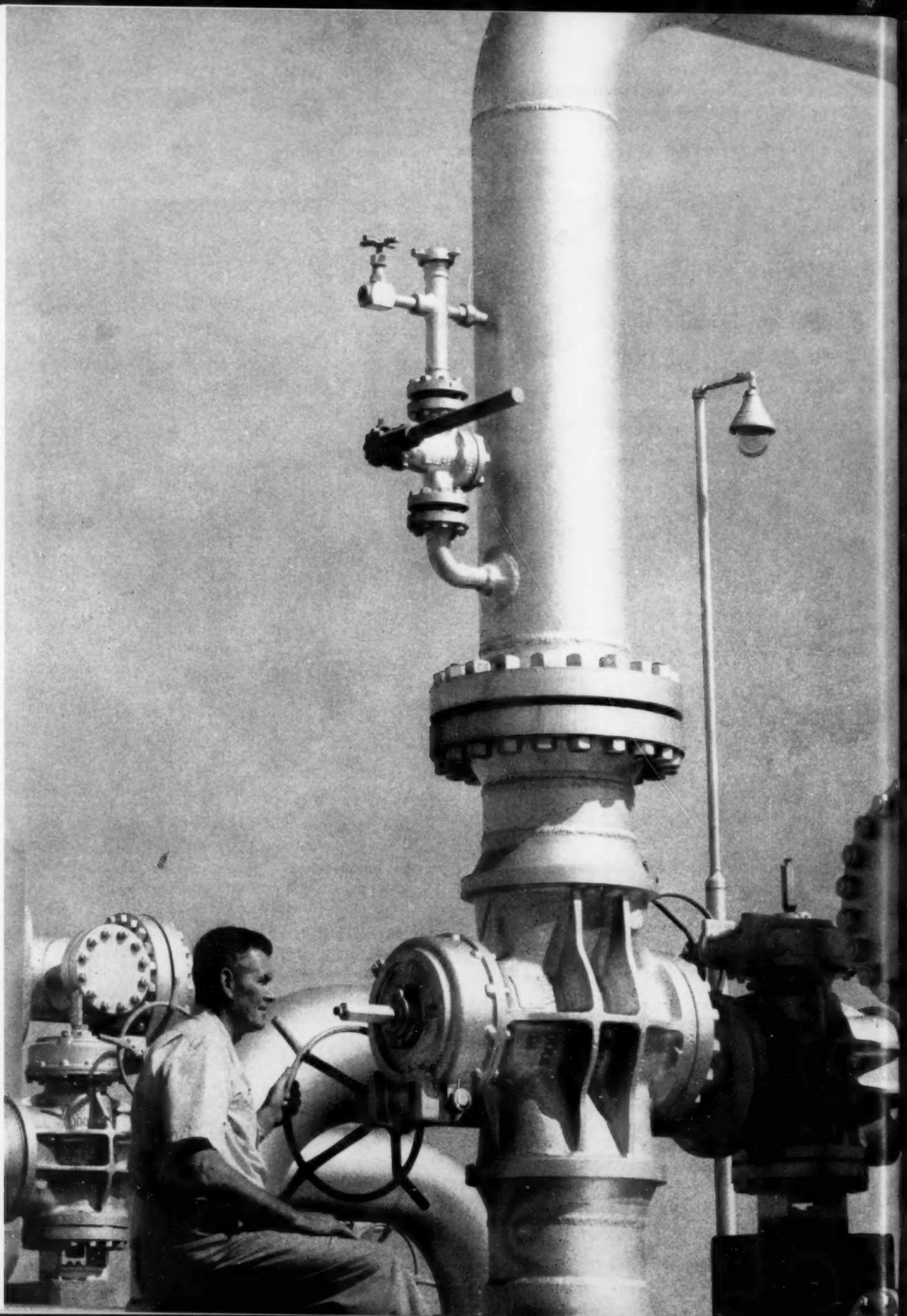
Simple maintenance—Lifting the cover exposes the entire gas turbine for inspection . . . a feature pioneered by Westinghouse.

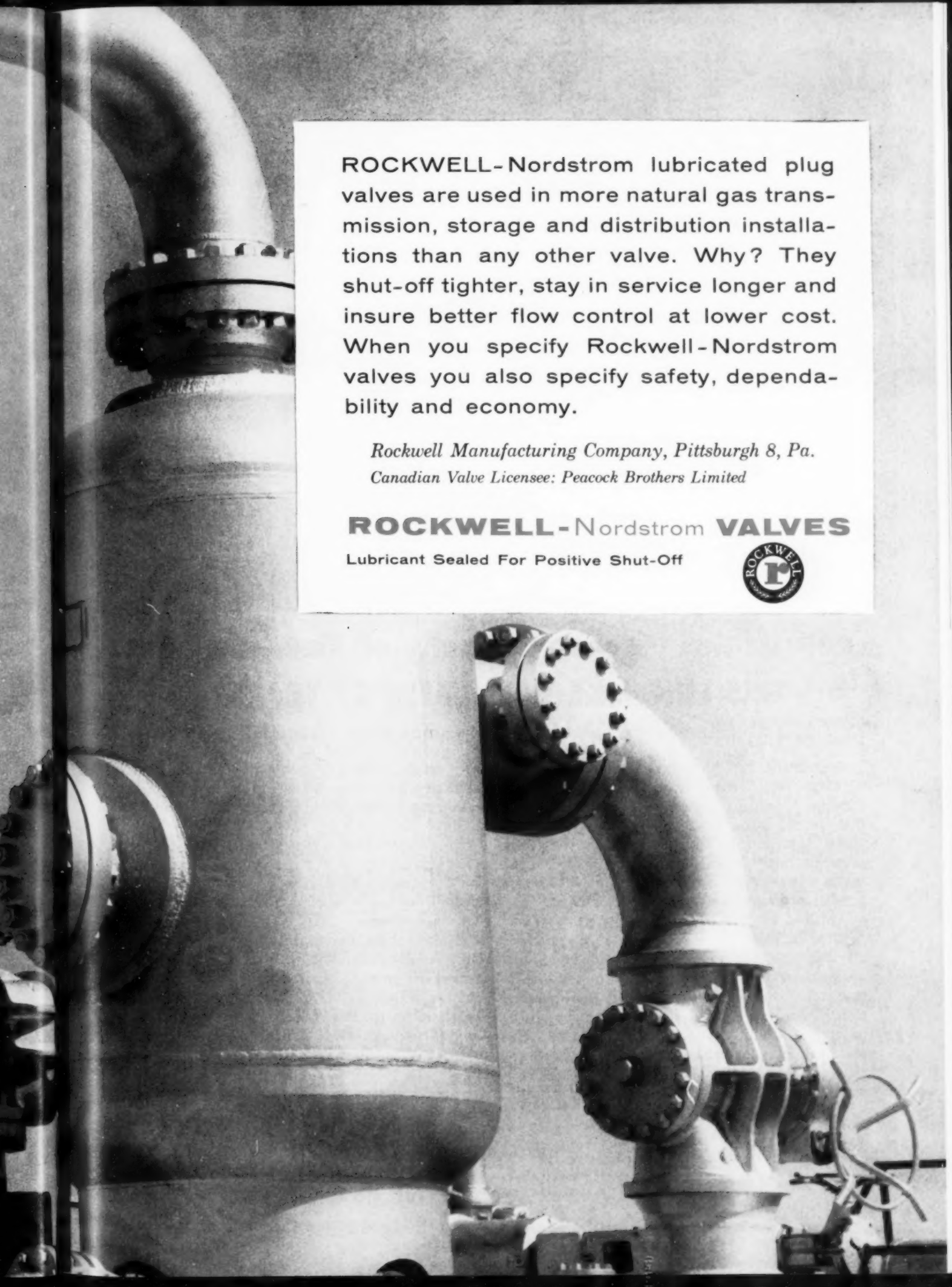
Low operating costs—Minimum man power and low lube oil consumption are just two of the many operating cost advantages.

No cooling water needed — Eliminate water-handling problems and risk of water supply failure.

Challenge us to prove that the modern Westinghouse gas turbine can cut your gas transmission costs. Contact your Westinghouse representative or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-50601

YOU CAN BE **SURE**...IF IT'S **Westinghouse**





ROCKWELL-Nordstrom lubricated plug valves are used in more natural gas transmission, storage and distribution installations than any other valve. Why? They shut-off tighter, stay in service longer and insure better flow control at lower cost. When you specify Rockwell-Nordstrom valves you also specify safety, dependability and economy.

Rockwell Manufacturing Company, Pittsburgh 8, Pa.
Canadian Valve Licensee: Peacock Brothers Limited

ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-Off

Natural Gas Pipeline Company of America Finds GAS LINE LIKE NEW AFTER 27 YEARS!

Bitumastic coal-tar enameled pipe to be re-used

In relocating its line to make way for a new highway near Truro, Iowa, the Natural Gas Pipeline Company of America removed some 900 feet of Bitumastic® enameled pipe laid in 1930. According to Mr. D. C. Allen, District Superintendent, this 24-inch seamless steel tubing is in such good condition that it will be reconditioned and used again as new pipe.

Applied by the rolling and "granny-rag" method in 1930, the Bitumastic XXH Enamel on this line was in excellent condition. The asbestos-felt overwrap, originally applied loose, was torn from soil stresses, but the Bitumastic enamel coating showed no serious disbonding or deterioration. At the time of relocation, the section had been under cathodic protection for two years. Natural Gas Pipeline Company of America records show no corrosion leaks on this section during the entire 27-year period underground.

Case histories such as this prove the unmatched protective ability of coal-tar enamel. In these days of rising material costs, you can't afford to gamble your entire pipeline investment on a less effective coating.

Your Koppers representative will be glad to give you full information on Bitumastic coal-tar enamels Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, New York, and Woodward, Alabama. In Canada: Koppers Products, Ltd., Toronto and Edmonton.

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PROTECTIVE COATINGS

Straddle Stringer
A straddle carrier saves 10 to 12 hours on submarine gas lines laid for Creole Petroleum Corporation in Lake Maracaibo. Instead of using a side boom tractor to transport the weight coated, 30-inch pipe, the carrier moves the 60 joints of the required 2500-foot lengths from coating to welding yard where it is placed on small rail cars. Floats are attached and pipe is run out into the Lake at Los Moroches, Venezuela where Trans-Caribbean, Division of Tellepsen Construction Company, is performing the work.

Northern Natural Files For $6 Million Facilities

A Northern Natural Gas Company application seeking to construct $6 million worth of facilities in Texas, Oklahoma and Kansas has been filed with the Federal Power Commission.

The application, of the budget-type designed to eliminate small filings during the balance of 1957 and in 1958, asks authority to attach new supplies of gas to its system from small areas adjacent to its pipe line. The volumes of gas purchased would become part of its over-all gas supply and are not contingent upon any expansion of its main line system.

French to Construct 120-Mile Crude Line

Algiers reports say that work has begun on a 120-mile crude oil pipe line from Hassi Messaoud to the rail head at Touggourt.

The line was to be built by the French Government.

Pipe diameter is ten inches or larger, and completion is expected to be in December. Throughput is expected to average 10,000 barrels per day in 1958 and 16,000 barrels daily in 1959.

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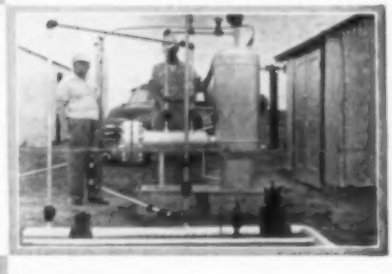

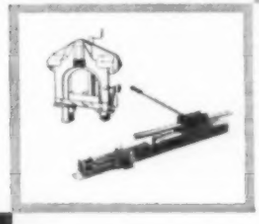

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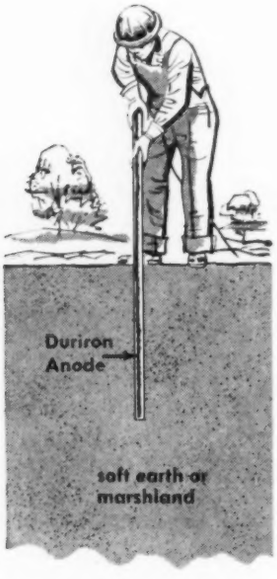
32 DURIRON® ANODES protect 11,000 feet of steel water line without backfill

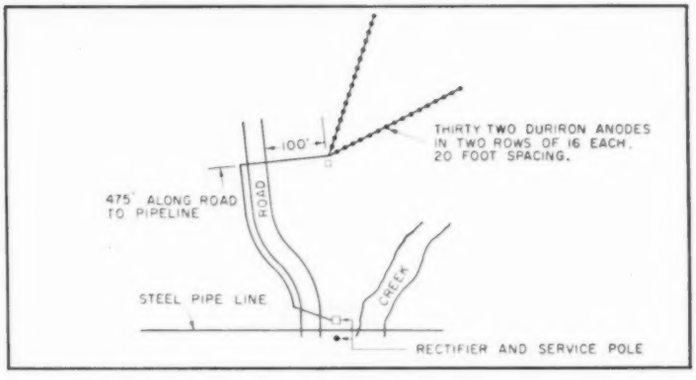
The Problem:

An isolated section of 11,000 feet of steel water line needed cathodic protection. Tests showed current requirements to be 40 amps., but replacement of adjacent wood stave lines called for extra capacity. Ground was a peat bog with water table standing at 6 inches below surface, making backfill methods impossible.

The Installation:

32 Duriron Anodes (2" x 60") were installed without backfill, by digging through the dry surface and then pushing anodes down until the tops were 3 feet below surface. Anodes were installed 20 feet apart, in two rows, with a calculated resistance of one ohm, based on previous experience with similar installations. While conventional backfill columns would have reduced the number of anodes necessary, the use of bare anodes constituted a major saving in cost.

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THIRTY TWO DURIRON ANODES IN TWO ROWS OF 16 EACH. 20 FOOT SPACING.
475' ALONG ROAD TO PIPELINE
ROAD
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The Performance:

The anode bed is discharging 60 amps. at a terminal voltage of 59 volts. The entire line section is under protection, the minimum potential being 1.18 volts. This affords ample margin to handle prospective additions to the line. Agreement between actual and calculated anode resistance is quite close.

Action:

For further information on this particular installation or for technical assistance on other Duriron impressed current anode installations, write:

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CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, INC. / DAYTON, OHIO

PROPOSED PIPE LINE CONSTRUCTION

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

U. S.

Cape Pipe Line Co., Philadelphia, 100 miles, Delaware Bay to the Philadelphia refining area, planned.

Carnegie Natural Gas Co., Pittsburgh, Penn., 13 miles, 55⅜ and 43¼ inches, gas, to provide coke-oven gas to six plants in Pittsburgh, Penn., area, contracts let to Williams Brothers Co., Tulsa.

Chicago District Pipeline Company, 52 miles, 30-36 inch, gas, from Natural Gas' proposed line at Joliet to Chicago, $13 million, temporary FPC authorization.

Cities Service Gas Co., Oklahoma City, 116 miles, gas, facilities in Kansas and Oklahoma and pipe lines in Kansas, $11.4 million, authorized.

41 miles, 30-inch from Verdigris River to the Petrolia compressor station; 33 miles, 30-inch between the Petrolia and Welda compressor stations; 4 miles, 4-inch in Wilson County, Kansas, and 6 miles, 12-inch gas line in Reno County, Kansas, plus replacement of facilities in Kansas, $6.5 million, temporary FPC authorization.

Clark Oil & Refining Corporation, 15 miles, from Clark refinery at Blue Island to Indiana Harbor area of Lake Michigan, and refining capacity additions, $7 million, planned.

Coastal States Gas Producing Co., Corpus Christi, Texas, 45-mile, gas gathering system in Bee County, Texas to connect with Texas Eastern's main pipe line, $1 million, planned.

Coastal Transmission Corp., Houston, 574 miles, 22-24 inch, gas, from McAllen, Texas to Baton Rouge, La. connection of Houston, Texas Gas and Oil plus 414 miles of laterals, $55 million, authorized.

Colorado Interstate Gas Co., Colorado Springs, 734 miles, 24-30 inch, gas, from Texas & Okla. Panhandle to Kit Carson, Colo., to Beatrice, Neb., plus four compressor stations, $87 million, temporary FPC authorization.

50 miles, 22 inch, gas, from Mocane area to existing system at Hooker, Okla., authorized.

Deep Rock Gas Co., Oklahoma City, 120 miles, 6-inch, LPG, from Tioga, N. D., to Canadian border, planned.

Derby Refining Co., 200 miles, 12 inch, crude, from Meade County, Kansas, to Wichita, Kansas, considered.

Eastern Shore Natural Gas Company, Salisbury, Md., 124 miles, 8⅝ and 6⅝-inch, transmission lines and facilities on eastern shore areas of Delaware and Maryland, $3 million, authorized.

El Paso Natural Gas Co., El Paso, 835 miles, 4½-34 inch, field and main lines, gas, facilities in Texas, New Mexico and Arizona to deliver gas to Southern Calif. Gas Co., Southern Counties Gas Co., and Pacific Gas & Electric Co., $80 million, 362 miles authorized and contracts let.

500 miles, 34 inch, gas from Twin Falls, Idaho to California border near Las Vegas, Nev., planned.

4½ to 20 inch, field lateral lines, gas, small installations to attach new supplies of gas from independent producers in the general area of existing transmission system in Texas, New Mexico and Arizona, authorized. Gas facilities for delivery of additional 285 Mmcf per day to customers in Arizona and California, $126 million, before FPC.

18.1 miles, 12¾ inch, gas, loop between Good Field, Borden County, Texas, and the East Vealmoor plant in Howard County, Texas; addition of 810 hp. to Vealmoor station; addition of 19 Mmcf dehydration capacity to Vealmoor plant, and additional meter facilities, temporary FPC authorization.

Emerald Pipe Line Corp., 120 miles, 6 inch, products, from Sunray, Texas, to Tucumcari, N. M., planned.

Equitable Gas Company, Pittsburgh, Penn., development of Rhodes natural gas storage pool in Lewis County, W. Va., and construction of 11.7 miles of storage pipe line and other facilities, $2,091,430, authorized.

Gillette Pipeline Co., Cheyenne, Wyo., 103 miles, crude, from Dead Horse Creek field to Casper, Wyo., planned.

Great Lakes Pipe Line Co., Kansas City, Mo., 93 miles, products, from Minneapolis and St. Paul to petroleum terminal in northwestern Wisconsin, contracts let.

Great Northern Railway, St. Paul, 400-600 miles, 12-20 inch, crude, from Williston Basin to St. Paul-Minneapolis and Duluth-Superior areas, considered.

Gulf Interstate Gas Co., Houston, 12.8 miles, 20 and 6 inch, gas, loop line in Louisiana, $730,000, FPC temporary authorization.

Harry Bass & Sons, Inc., Dallas, pipe line network from well heads to compressor stations to central gasoline plant plus line to railroad in Pembina field, Alberta, $17 million, approved.

Home Gas Co., Pittsburgh, Penn., gas facilities in New York, $3.8 million, authorized.

Humble Oil & Refining Co., 200 miles, main gathering system line of varying sizes, 250 miles, 26 or 30 inch main carrier, gas, from southwest Texas to Houston, plus gas processing and cycling plant near Corpus Christi, $75 million, planned.

Humble Pipe Line Company, 90 miles, 16 inch, crude, from Hawley to Comyn, Texas, $3.5 million, planned.

Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, before FPC.

Katy and New York Central Railroads, 2500-mile, 10-12 inch, LPG, from Houston, Texas, to New York, Considered.

Kerr-McGee Oil Industries, Inc., 24 miles, 4 inch, gas, to connect wells with its Breton Sound production island off the Louisiana coast, authorized.

Laurel Pipe Line Co., Philadelphia, 440 miles, 14-24 inch, products, from Philadelphia to Pittsburgh to Cleveland, $50 million, planned.

Magna Pipeline Co., 40 miles, gas, underwater line from Anacortes, Wash., to Victoria, B. C., $6 million, planned.

Manufacturers Light and Heat Co., Pittsburgh, Penn., 13.8 miles, 10 and 12 inch, gas, natural gas facilities in Ohio and West Virginia, $757,300, authorized.

Michigan Gas Storage Co., Jackson, Mich., gas facilities in central Michigan, $2 million, authorized.

Michigan-Wisconsin Pipe Line Co., Detroit, 472 miles, 4- 24-inch, gas, main line loops and extensions in Wisconsin, Illinois, $17.6 million, before FPC, temporary authorization for a part, 47.5 miles let to G. E. T. Construction, Inc.

Midwestern Gas Transmission Co., Houston, 2067 miles, 3-24 inch, gas, from Emerson, Manitoba, to Nashville, Tenn., $103 million, before FPC.

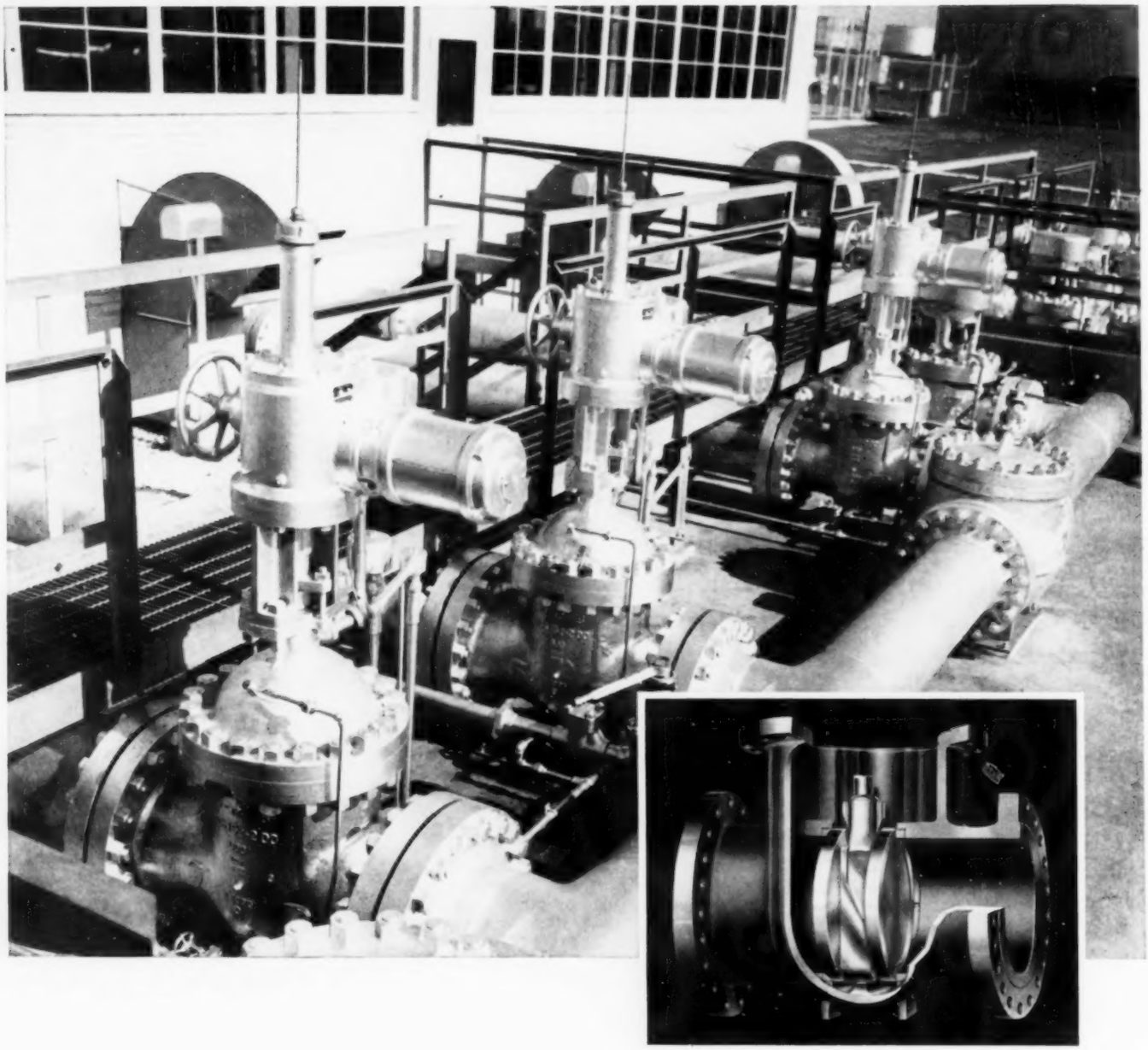
Natural Gas Pipe Line Co. of America, 416 miles, 36 inch, gas, loops at various points along existing line between Beatrice, Neb., and Joliet, Ill., $76.2 million, temporary FPC authorization.

New York State Natural Gas Corp., Pittsburgh, Penn., gas pipe line facilities in New York state, $1.2 million, authorized.

North Carolina Natural Gas Corp., 630 miles, 2-16 inch, from Transco's system near Mooresville across to southeastern North Carolina, authorized.

Northern Natural Gas Co., Omaha, 167 miles, 20 inch, gas, from Farmington, Minn. to Duluth, Minn., and Superior, Wis., $12 million, before FPC.

42 miles, 10 inch, gas, from Rochester, Minn. to Winona and Goodview, Minn., $963,000, before FPC.



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permanent good behavior!

THE reason is very simple. These valves are different! They were designed with one objective uppermost—to be uneffected by the very conditions that lead to trouble in ordinary gate valves. And so it was that Darling came up with the fully revolving double disc, parallel seat principle. It minimizes friction and avoids wear concentration. It assures remarkably easy operation with self adjustment for positive closure. It automatically compensates for any valve body deflection.

The proved result is that these Darling valves consistently show superiority in service life, low maintenance, positive operation and trouble-free performance. Savings naturally result. Write for Catalog No. 57.

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DARLING VALVE & MANUFACTURING CO.

Williamsport 27, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

365 miles, gas, new facilities in Minn., Iowa, S. D., Neb., Wis., plus 1090 miles of branch line and station facilities, $65.7 million, authorization for a part. Gas facilities in Texas, Oklahoma and Kansas, $6 million, before FPC.

Northwest Pipeline Corp., Salt Lake City, 350 miles, 6-10 inch, crude and products, Four Corners area to Salt Lake City, $15 million, planned.

Ohio Fuel Gas Co., Columbus, Ohio, 56 miles, 18-24 inch, Richland County, Seneca County, Sandusky County to Toledo area, $4 million, contract for 22 miles awarded to H. L. Gentry Construction Co.

33 miles, 4 to 20 inch, various counties, Ohio, $1 million, authorized.

21.8 miles, 12¾ and 20-inch, natural gas facilities in various counties, Ohio, $1 million, authorized.

Ohio Oil Company, Findlay, Ohio, 350 miles, 12 inch, products, from Wood River, Ill. to Chicago, 84 miles let to Panama-Williams Corp.

Pacific Gas & Electric Co., 1,300 miles, gas transmission, Alberta, Canada to Antioch, Calif., $380 million, planned.

Pacific Northwest Pipe Line Corp., Salt Lake City, 1000 miles, gas, gathering system in San Juan Basin and sales laterals in Washington plus compressor facilities, $30 million, planned.

112 miles, gas, laterals, in Washington and Idaho, $4.5 million, authorized.

Facilities and horsepower additions, $5.7 million, temporary FPC authorization.

Panhandle Eastern Pipe Line Co., Kansas City, 33 miles, 16 inch, Muncie, Ind., lateral, planned.

Pennsylvania Gas Co., Warren, Penn., 38 miles, 8, 10 inch, gas, in Erie and Warren Counties, Penn., and Chautauqua County, N. Y., $2.6 million, authorized.

Permian Basin Pipeline Co., Omaha, Neb., 26.8 miles, 10 inch, gas, from a point on existing system in Pecos County, Texas, to a gasoline plant in Pecos County, Texas, $787,100, temporary FPC authorization.

Piedmont Gas Co., Hickory, N. C., 78 miles, 2-8 inch, gas, from connection with Transcontinental Gas Pipe Line to serve customers in North Carolina, $2.6 million, authorized.

Shell Pipe Line Corp., 100 miles, 16-20 inch, from Shell's Southwest Pass terminal to Shell's Norco Refinery near New Orleans, planned.

Sinclair Pipe Line Co., 150 miles, 20 inch, crude, from Teague to Houston, planned.

Southern Kansas Pipe Line Co., Inc., 200 miles, 6-10 inch, crude, southwestern Kansas to Arkansas City, Kansas, planned.

Southern Natural Gas Co., Birmingham, 60 miles, gas, to connect transmission system to reserves in Plaquemines, St. Bernard and Jefferson parishes, La., and waters adjoining, plus compressor, meter and regulating facilities, $8 million, authorized.

69 miles, 24 inch loop, gas, along the east leg of the Louisiana supply system between Toca and Franklinton compressor stations; 67 miles, 26 inch loop, gas, from Franklinton to Gwinville, La., to bring gas from 12 fields on south Louisiana to main system at Gwinville, $37.5 million, before FPC.

Tennessee Gas Transmission Co., Houston, 632 miles, 30 and 24 inch, gas from Louisiana delta to Portland, Tenn. and Coudersport, Pa. to Hamburg, N. Y., temporary FPC authorization.

264 miles loop lines in Tennessee, Kentucky, West Virginia and Pennsylvania, temporary FPC authorization.

Compressor stations in Mississippi, Tennessee, New York, Pennsylvania and additions in Tennessee, Kentucky, Ohio and Pennsylvania, $129 million, temporary FPC authorization.

Texas Eastern-Penn-Jersey Transmission Corp., Shreveport, La., 65½ miles, gas, from Delmont, Penn., to Lambertville, N. J., before FPC.

24,000 compressor hp additions to existing stations, $4.4 million, temporary FPC authorization.

Texas Eastern Transmission Corp., Shreveport, La., 267 miles, 14 and 30 inch, gas, Louisiana, Mississippi, Pennsylvania and New Jersey, $50 million, before FPC.

96.5 miles, 30-inch loop, from Kosciusko, Miss., and Uniontown, Penn.; 9.4 miles of supply laterals; a 10,250 hp compressor station, and 33,360 hp to existing compressor stations, $24.5 million, authorized.

Texas Eastern Transmission Corporation and Wilcox Trend Gathering System, Inc., gas compressor stations, $4 million, authorized.

Texas Gas Gathering Corp., Shreveport, 36.6 miles, gas, gathering system in Rodney Field, Jefferson County, Miss. and from North and South Locust Ridge, Lake St. John Field in Tensas and Concordia parishes, La., $855,413, Before FPC.

Transcontinental Gas Pipeline Corp., Houston, 87 miles, 24 inch, and 56 miles, 6-10 inch, gas, gathering systems, Southeastern Louisiana, $14 million, authorized.

24-inch, gas, offshore from South Louisiana, planned.

201.94 miles, 36 inch, 106.13 miles, 30 inch, three new compressor stations totaling 24,084 hp., additions at five compressor plants totaling 12,000 hp, added facilities at 13 compressor plants, storage service, and purchase laterals of 8, 10, 12, 14, 16 and 20 inches, expansion of system from Texas across the Hudson River to New York, $126.8 million, Before FPC.

Trans-Western Pipe Line Co., 800 miles, 30-inch, gas. Four Corners area to California, $200 million, planned.

Underground Storage & Exploration, Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., $9 million, approved.

95 miles, 6-8 inch, laterals to Mauch Chunk, Penn., and to Philadelphia, planned.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. government.

Alaska-Yukon Refiners and Distributors, Ltd., Edmonton, Alta., 150 miles, products, serving Alaska and Yukon territory, $3.5 million, planned.

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, proposed.

Canada Southern Petroleums, Ltd., Calgary, 400 miles, crude, from Peace River region of northeast British Columbia to Bella-Coola, planned.

Cie. de Recherche et d'Exploration de Petrole au Sahara, 530 miles, 16 inch, crude, Edjele field in Algeria to a port on Libyan coast, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Cuban Gas Transmission Co., 650 miles, gas, from Campeche area of Mexico across Yucatan and under Gulf of Mexico to Havana, Cuba, 120 miles would be submarine, considered.

Development and Resources Corp., 70 miles, 8 inch, gas, from Agha Jari oil field to Ahwaz, Iran, and a polyvinyl chloride plastics plant at Ahwaz, planned.

Entre Nazionali Idrocarburi, Rome, Italy, crude, from Qum field in Iran to the Mediterranean Sea, considered.

Hydrocarbons Pipeline, Ltd., Winnipeg, Manitoba, 880 miles, 6-8 inch products from Edmonton, Alta. to Winnipeg, $35 million, partial authorization.

Iraq Joint Venture Pipe Line, 1200 miles, 38-10 inch, crude, from head of Persian Gulf through Iraq to Turkish coast of Mediterranean, $840 million, planned.

Iranian Consortium, 50 miles, 26-28 inch, crude, from Gach Saran field to proposed terminal near Bandar Mashur, planned.

22 miles, 16 inch, and 30 miles, 16 inch, crude, from Agha Jari field to Bandar Mashur, planned.

Mene Grande Oil Co., 42 miles, 16 inch, crude, from Ceuta field in Lake Maracaibo to Bachaquero terminal, $6 million, planned.

76 miles, 30 inch, from Oficiana to Puerto La Cruz, Venezuela, considered.

61 miles, 6 inch, LPG, from Anaco to Puerto La Cruz, Venezuela, considered.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran, $5 million, planned.

1000 miles, 38 inch, crude, from central Iran to the Turkish Mediterranean coast, considered.

Northern Utilities Co., 35 miles, 16 inch, gas, in Fremont Natrona County, Wyo., area; 8 miles, 12 inch, around Casper; 6 miles, 8 inch, from Sand Draw gas field to Beaver Creek field; 12 miles, 6 inch, from Beaver Creek field to the system servicing the Riverton-Lander area, planned.

Northwestern Utilities, Ltd., Edmonton, 75 miles, 16-inch, from Pembina field to Edmonton, natural gas, planned.

12,000 hp needs a lot of cooling!

One of six Young HC " 1415 units used to cool six 2,000 hp Ingersoll Rand Compressor engines at the new American Louisiana Pipeline Company's compressor station at Defiance, Ohio.

Young DOES THE JOB at this new compressor station

The entire cycle of cooling the engine jacket water and lube oil is automatic; each unit being complete with shutters automatically controlling the fan motors.

Wherever there are "big names" in industry you will find, with increasing frequency, Young heat transfer equipment in operation either as standard units or designed to meet specific requirements of an installation.

If you have a heat transfer problem contact your nearest Young Radiator Company representative — see yellow pages of your telephone book — or write to Young Radiator Company, Dept. 397-M, Racine, Wis. There is no obligation.

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Petroargentina, Bahia Blanca, Argentina, 370 miles, 16 inch, crude, from Newguen to Bahia Blanca, Argentina, $40 million, planned.

Petroleos Mexicanos, 150 miles, 22-inch, gas, from Monterrey to Reynosa to tie into Texas Eastern system, contracts let.

108 miles, 10 inch, gas, from Gral. Escobedo to Monclova to tie into Reynosa-Monterrey gas pipe line, $9 million, planned.

600 miles, 24 inch, gas, from Pemex City to Mexico City, $50 million, planned.

38 miles, 4 inch, products, from Mexico City of Toluca, $500,000, planned.

126 miles, 8, 6 and 4 inch, products, from Mexico City to Cuernavaca and Puebla, $2.5 million, planned.

Royal Dutch Shell Co., 155 miles, 24-30 inch, from German Rhineland to mouth of Rhine River, planned.

Royalite Oil Co., Calgary, 380 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, planned.

Saharian Pipe Line Co. (subsidiary of Cie. Francaise des Petroles, Algerie), 100 miles, 6 to 10 inch, from Hassi Messaoud field to Touggourt, Algeria, planned.

Saskatchewan Power Corp., Regina, Sask., 80 miles, gas, Hatton gas field to Success, Sask., planned.

40 miles, gas, Moose Jaw to Regina, Sask., planned.

Stanmount Pipe Line Co., 140 miles, 10 inch, crude, Cayiga and Beaver Lake fields, N. D., to connect with Interprovincial Pipe Line, planned.

Sturgeon Pipe Line Co., 100 miles, 12-inch, Sturgeon Lake field to Trans-Mountain system, $6.5 million, planned.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

Trans-Canada Pipe Line, Ltd., Calgary, Alto. 2294 miles 20, 30, 34 inch, gas, Alberta to eastern Canada, $378 million: 659 miles completed; contracts let for 683 miles; 735 miles to be laid in 1958.

Trans-Europe Pipe Line, 700 miles, 30 inch, main trunk, crude, from Mediterranean to northern Europe, considered.

Trans-Mountain Oil Pipe Line Co., 100 miles, loops near Kamloops, B. C. and Edson, Alta. plus pump station, tank farm and three temporary stations, $40 million, 50 miles let to Dutton-Williams Bros.

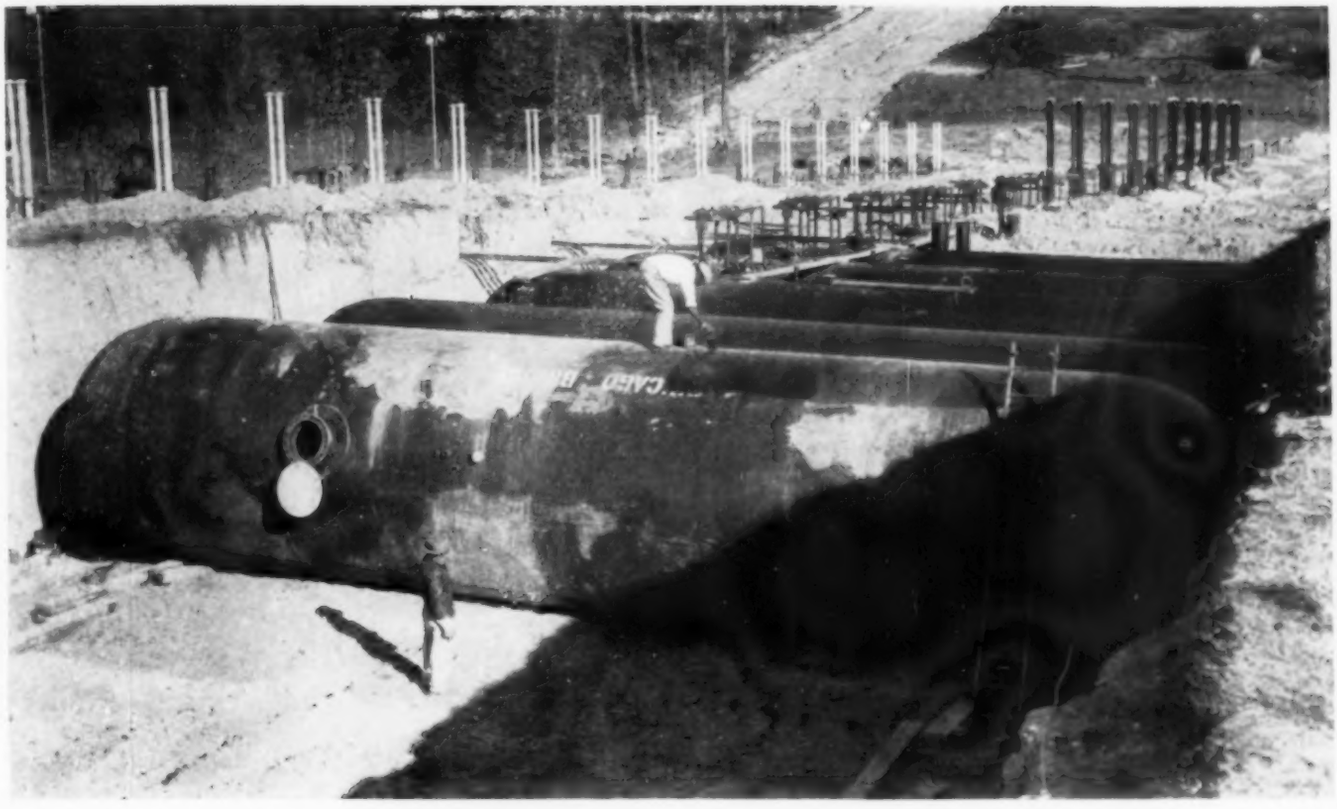
Westcoast Transmission Company, Ltd., 174 miles, 30-inch, gas, Savanna Creek gas field, Alberta, to British Columbian border, planned, $45 million.

Winnipeg and Central Gas Co., Winnipeg, Mant., 450 miles, 4-8 inch, LPG, from Tioga, N. D. to Winnipeg, Canada, $20 million, planned.

Yacimientos Petroliferos Fiscales, Buenos Aires, Argentina, 621 miles, 12-inch, products, Mendoza to San Lorenzo, Argentina, $19 million, planned.

281 miles, 12¾ inch, crude, Pichanal to San Miguel Tucuman to Techint, S. A., planned.

215 miles, 8 and 10 inch, crude, from interior of Bolivia to Chilean port of Arica, contracts let to Williams Brothers Sudamericana, Ltd.



ATLANTA GAS LIGHT COMPANY INCREASES PROPANE STAND-BY

The 1956 addition to Atlanta Gas Light Company's liquid propane storage expansion program, which began two years ago, consisted of twenty 30,000 gallon tanks. The total stand-by propane-air capacity serving Atlanta became 2.7 million cubic feet per hour from 78 tanks like those pictured. The white stacks mark the location of 20 tanks installed during two preceding years. The 1957 expansion program will provide for 20 additional tanks at this plant and seven in other properties.

Underground protection of these tanks begins at the tank fabricating shop, where a special Royston inhibitive, insulating primer is applied. At the installation site the tanks are given a spray coat of Roskote Mastic. This is followed by a fog coat of non-conductive, contrast paint. The latter insures complete coverage of the second spray coat of Roskote Mastic, which completes the prescribed underground protection.

The Atlanta Gas Light Company has similar installations in Waycross, Macon, Valdosta, Rome and Athens.

If you are planning an underground or above ground installation of tanks, or piping, write for complete information on the Roskote time-proven, economical protective coating system.

Royston Laboratories, Inc.
Box 112-D, Blawnox, Pittsburgh 38, Pa.

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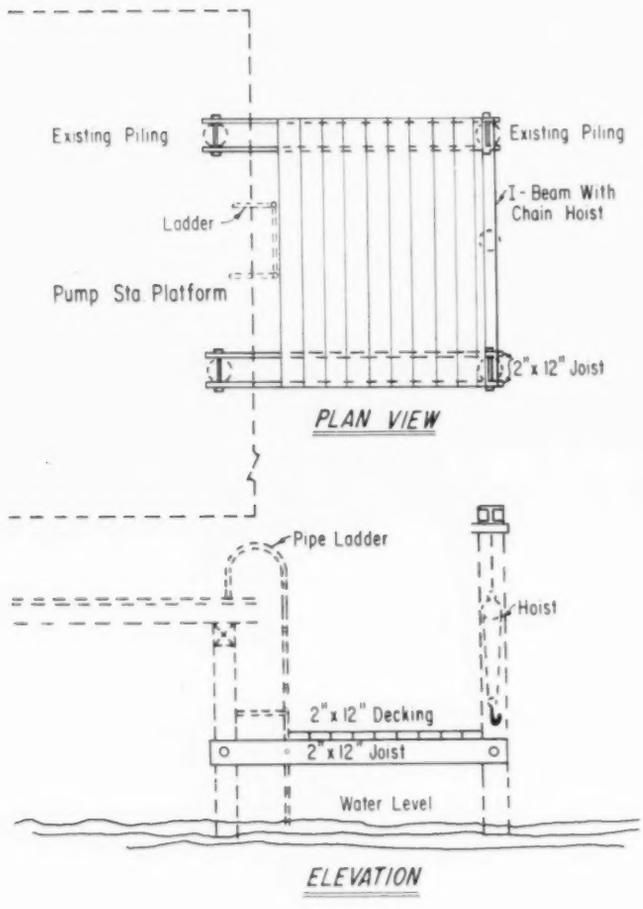
BRANCH OFFICES IN ATLANTA, CHICAGO, HOUSTON, PHILADELPHIA, SAN DIEGO AND TULSA. WAREHOUSED IN NORTHEAST, SOUTHEAST, NORTH CENTRAL AND SOUTH CENTRAL REGIONS.

How to do it

PIPE LINE HINTS

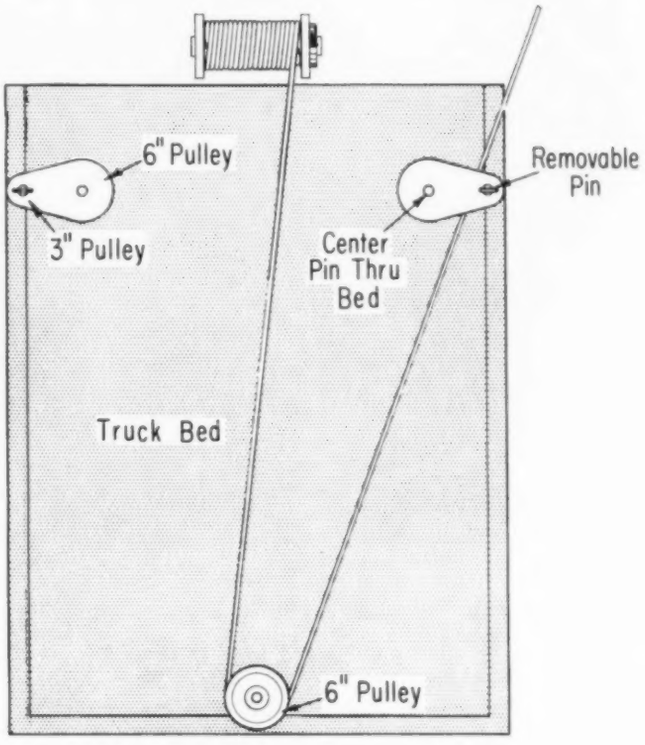
$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



Construct Simple Platform For Safe Repairing of Boats

In the marsh country of South Louisiana boats play an important part in transportation. When repairs need to be made, it is necessary to take the boat in to the ways even when only minor repairs need to be made. If minor repairs are made at other locations, it is necessary to pick only the calmest days and even then it is a hazardous undertaking.

Construction of a simple platform close to water level and adjacent to existing piers or platforms will provide a safe working area for minor repairs. A platform such as the one shown in the above sketch can be constructed at very little expense. Two three by ten stringers are run from piling already driven back to piling under pier or station platform. The top is floored from the back side of the piling to the ladder. Addition of a hoist will make it possible to raise the boat out of the water when necessary.



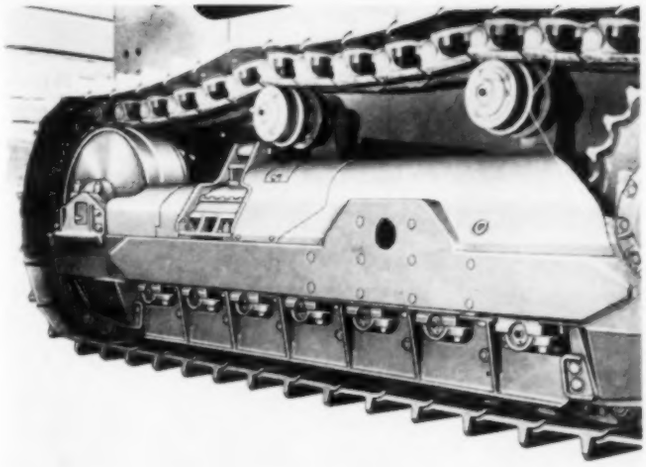
Use Front End Winch Pulley To Preserve Truck's Body

Installing a front end winch pulley set on the bed of a truck or trailer will prevent bending or damaging the truck body when using the winch line to pull the truck ahead over slippery ground. The rear end pulley also can be used for normal winching without having to line up the truck.

The combination six-inch and three-inch pulley block mounted on the front sides of the bed will act as a guide to keep the truck from "jack knifing" when pulling forward. It serves the same purpose as using a block and chain on the bumper. Conversion from the rear pulley to the side pulley can be made by one man in about two minutes.

With this arrangement winching can be accomplished from either side or to the rear. This will save having to line up the truck.

To install the pulleys, cut three 1¼-inch holes in the truck bed—one in the center rear of the bed and one on each side. Sleeve the hole with 1¼-inch pipe. Using a block with a combination six-inch and three-inch pulley, place a 1¼-inch shaft long enough to reach through the truck bed through hole in the six-inch pulley. The six-inch pulley will keep the winch line off the cab and the three-inch pulley will act as a guide. The rear block is the same as the forward block except that there is no three-inch pulley and the block is left open.



Extend a Tractor's Life With Track Roller Guards

Track roller guards will keep rocks out of the track. Use of this device will provide longer, more economical service life for final drives and all track component parts of tractors engaged in rock work. Additionally, these guards assist in holding the tracks on the rollers in rugged and steep slope terrain, reducing wear on the roller flanges and idler pilot rim.

Damage to component parts of tractor tracks can occur in rocky areas. If the tractor works next to a bank or turns in rock, the rock feeds in between the rollers and the track. As the tractor moves forward or backward, a "rock crushing" action is set up. When the tractor moves backward, rock feeds in between the idler and the track, and as it moves forward, the rock feeds in between the sprocket and the track. All track components are subjected to unnecessary abrasive and impact damage.

These damaging conditions exist even when the track tension is correctly adjusted. The track recoil mechanism is designed so the sprocket can, under some conditions, jump a tooth, thus reducing the possibility of severe damage to the final drive. However, when too much rock finds its way into the track, the recoil mechanism cannot allow sufficient movement of the idler to feed the rock through.

Attach Jack to Bumper To Hold a Truck Level

Lifting heavy loads using a winch mounted on a small truck many times will tip the truck. This jack attached to the bumper will keep the truck level while lifting heavy objects.

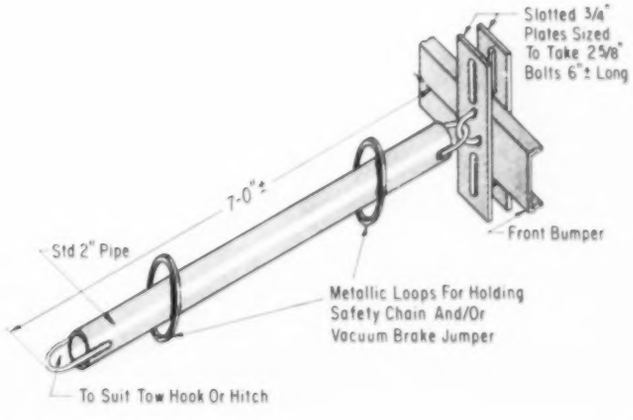
To construct the jack, a collar is welded to the bed of the truck. A piece of pipe which will just fit through the collar is cut to the proper length. A piece of channel iron is welded to the pipe to serve as a foot. With the pipe in the right position to hold the truck level, a hole is drilled through the collar and the pipe. To hold the pipe in position, a pin is run through this hole.

The hand winch can be constructed so that it will turn. With a jack such as this, loads can be lifted from either side or the end of the truck. Using this arrangement on a pick-up truck will make it possible to do a lot of jobs with smaller equipment that would require a large winch truck.

Affix Adjustable Tow Bar To Vehicle's Front Bumper

The adjustable end of this tow bar is attached to the front bumper of the vehicle to be pulled; the other end is connected to the towing vehicle's trailer hitch. The ring can be made to fit any size or type of hitch.

The metallic loops are for holding any jumpers that are needed between the towing vehicle and the equipment to be pulled. Some states require a safety chain in addition to a trailer hitch, and this chain can be attached to the loops. It may be desirable to have the towing vehicle equipped with adapters to handle any vacuum jumpers etc.


Slotted 3/4" Plates Sized To Take 2 5/8" Bolts 6" ± Long
7-0" ±
Std 2" Pipe
Front Bumper
Metallic Loops For Holding Safety Chain And/Or Vacuum Brake Jumper
To Suit Tow Hook Or Hitch

Velocity Reducing Baffle Prevents Water Damage

Controlling run-off water in mountainous terrain is an expensive though necessary part of road-making and location work. One operator, to provide adequate but controlled run-off from one elevated road or location to the next one below it, prepares the conduiting in the manner shown in the photograph.

To prevent re-cutting of ground at the outfall end, a plate is welded across the open end of the pipe, and an equivalent or even larger net open area is cut out of the upper half of the pipe close to the end plate. Velocity of rainy season run-off water, rushing down hill for perhaps several hundred feet, is effectively slowed with such a baffle and without materially affecting the volume that otherwise might have been handled by the pipe.

Velocity of the upward-jetting water easily clears away sediment and trash that tends to collect in the small pocket near the end plate. Cost of preparing the pipe in this manner easily is repaid by the saving resulting from reduced repair work and grading that otherwise would be necessary at outfall ends.

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Install Guard Railing To Protect Car Body

When tools or other equipment are hauled in the trunk of a car, many times they are too long to let the trunk close. This often causes the tools to rub against the car body and damage the car.

This simple guard will protect the car finish. Made of scrap material, it will support the tools and keep them away from the car body. The guard consists of a length of pipe or bar stock cut to the right length. Close to each end, steel bands are welded to the pipe. The steel bands are then bolted to the bumper.

With this arrangement the tools can protrude from the trunk and not damage the car. After the tools are in place in the trunk, they can be tied to this support and the trunk lid secured to the tools and the guard.

Sinclair Refining reports...

Instantaneous, accurate gaging with S&J Datalogger!

Sinclair's new S&J Datalogger permits reliable tank gaging regardless of time or weather conditions. In addition, the S&J Datalogger provides permanent records for checking each day's operation at Sinclair's Hartford, Illinois refinery.

Proven S&J Dataloggers are ready now to help you get records of tank levels, temperatures and other physical data—faster and more accurately.

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A subsidiary of General Precision Equipment Corporation

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For more data on advertised products, use Readers' Service Cards, last page.

Here's the Fast Easy Way to Anchor Pipelines

No heavy equipment to haul. Cuts costs to a fraction.

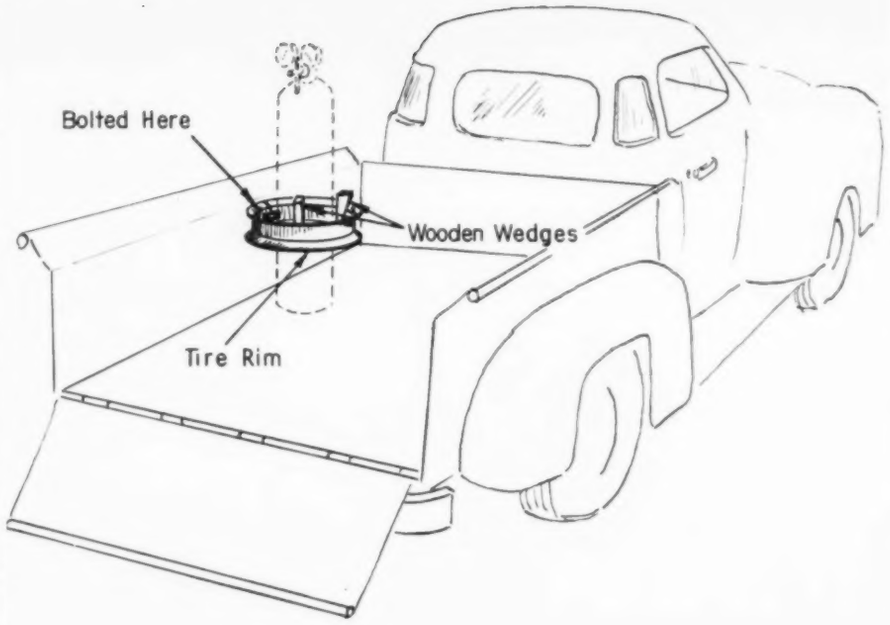
Chance Pipe Line Screw Anchors and Brackets greatly simplify pipe line anchoring, compared to other methods, and save many dollars in pipe line construction.

Chance Pipe Line Screw Anchors can be installed in pipe line ditches without extra digging. Using a power wrench the operator merely guides the anchor in place. The tool does the work.

Can be installed in the ditch without extra digging.

Write for catalog showing oil industry applications of Chance Earth Anchors.

A·B·CHANCE CO·
CENTRALIA, MISSOURI
TORONTO, ONTARIO, CANADA

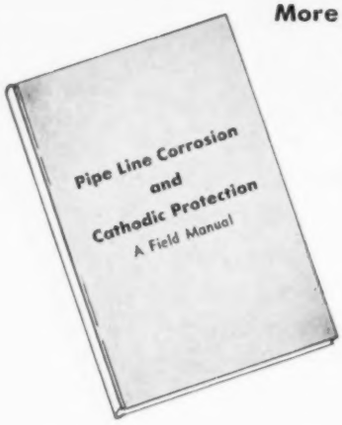


Fasten Tire Rim To Truck For Bottle Transportation

When a standard pick-up truck is needed to carry a bottle of oxygen or acetylene occasionally, this simple rack can add some good safety features. Fasten an old tire rim to the side of the bed of the truck—two bolts will hold it at the desired location. The bottles can be slipped down inside the rim and wedged in place with scrap wooden wedges if necessary.

More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."



Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

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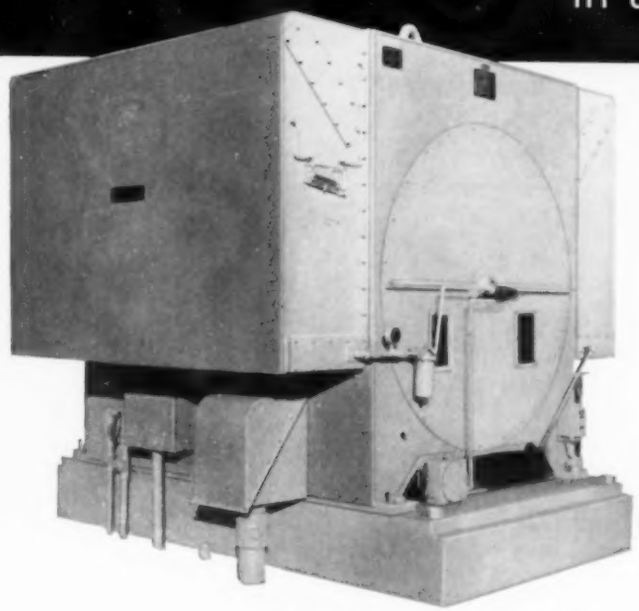
Install Retractable Steps To Reach High Truck Beds

To facilitate reaching high truck beds one company constructed steel steps which fold up under the bed when not in use.

The steps shown have solid steel sides with expanded metal for nonskid footing. While traveling, the steps have a drawer type arrangement which holds them between bed of truck and frame. During loading, the steps are pulled out and hinged over a bar welded to the rear end of the bed frame.

when **ELLIOTT** weather-protected motors are installed in an Outdoor Pipeline Station!



This Elliott 1250-hp, 2-pole, squirrel-cage induction motor, originally round frame as below, is one of the three motors which was rebuilt for year 'round weather protection. All four Elliott motors at the Laura Station are direct-connected to the oil pumps.

One of the three Elliott round-frame motors as it appeared originally.

Costs Are Slashed. The outdoor structure costs far less and maintenance as well as year 'round operating costs are reduced. Besides that, Elliott motors are especially designed for safe, dependable, trouble-free operation *in all kinds of weather.*

Take the case of the Service Pipeline Company in Illinois. Rebuilding the above Laura Station as an outdoor facility, this company installed four Elliott weather-protected squirrel-cage induction motors. The station includes a canopy which gives extra protection from rain and sun—added insurance against the possibility of direct sunlight tripping the thermal devices, and provides a chain hoist for maintenance. Both the concrete slab area and the canopy extend far enough to provide ample working space around pumping units.

Three of the four motors, originally dripproof round-frame, were rebuilt to weather-protected designs—resulting in additional savings. Windings were given added treatment by immersing coil ends and baking. Explosion-proof bearing temperature and oil pressure relays were provided to assure maximum safety for operation in a hazardous atmosphere. These and other features of the Elliott weather-protected motors permit the erection of simplified outdoor stations instead of more costly enclosed housings. For further details, call your nearby Elliott District Office or write . . .

ELLIOTT Company

Ridgway Division • Ridgway, Pa.

R7-1

For more data on advertised products, use Readers' Service Cards, last page.

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FLEET-LINE CO.
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WELDING FITTINGS

REDUCERS: Concentric and eccentric. Nominal pipe sizes 1" to 30", ASA B16.9, ASTM A234. Schedules 10 to 160, stainless steel, and other alloys. Special lengths and sizes.

SADDLES: Conventional, and for pressure vessel heads. Nozzle sizes from ¼" to 24". Fleet-Line saddles weld neatly into place in much less time, and with much less welding rod.

Complete encirclement saddles.

Fast interested service. Write for Literature.

STEEL FORGINGS, Inc.

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What's Happening among MEN in the INDUSTRY

William T. Ivey, chief statistician and planning engineer with Southern Natural Gas Company, has been appointed by the American Society of Civil Engineers Board of Direction as a member of the executive committee of the Pipe Line division.

W. T. Ivey

He will serve until October, 1961.

Ivey replaces **S. E. "Al" Huey** whose term recently expired. Huey was one of the original members of the initial committee on pipe lines organized in 1953. He became one of the organization's Advisory Group members recently.

•

James W. Knowles is the new district pipe line superintendent of **Alberta Gas Trunk Line Company, Limited** and is to headquarter at Oyen, Alberta.

Knowles was formerly with Continental Gas Pipeline in Alabama, Georgia and with Ebasco Services as chief inspector on construction of several pipe line projects in South Carolina and southern Georgia.

•

Charles E. Spahr, executive vice-president of **Standard Oil Company of Ohio**, was elected new American Petroleum Institute vice president for transportation at API 37th annual meeting in Chicago recently.

C. E. Spahr

Spahr was first employed by Standard Oil Company of Indiana in 1934, after which he served as an engineer with **Phillips Petroleum Company** from 1935 until 1939. He rejoined Standard Oil in 1939 and has been with the company in Ohio until the present with exception of a short leave of absence in 1952 when he served with the Petroleum Administration for Defense as Director of the Supply and Transportation Division in Washington, D. C.

He has been vice president and head of the Transportation department of Standard Oil of Ohio since 1952.

•

J. L. Irvin is the new president of **Gulf Refining Company**, wholly owned **Gulf Oil Corporation** subsidiary which will headquarter in Houston, and which operates crude oil and products pipe line facilities.

Other new officers of the firm are **W. L. Shannon**, vice president; **M. W. Ramsey**, vice president; **G. W. Conrad**, comptroller-treasurer; and **Robert Carter**, secretary.

Directors of the company are Irvin, Shannon, Ramsey, **Walter Clemons**, and **S. O. Tostengard.**

•

Ralph K. Paine, manager of the Pipe Line department of Standard Oil Company of California, is the new president of the Pipe Liners Club.

R. K. Paine

He succeeds **J. H. Wood, Jr.**, vice president of Atlantic Pipe Line Company.

Paine served as vice president of the club last year. He has been associated with Standard Oil Company of California since 1922, serving as engineer and general superintendent of pipe lines for the firm before his elevation to his present post.

•

David J. Ford is the new dispatcher of the Transportation department's Eastern division of **Sohio Pipe Line Co.** and will be responsible for the dispatching function in the division's pipe line system.

To be located in Mooresville, Ind., Ford replaces **W. R. (Reece) Crumb** who is retiring after over 40 years of Sohio service. Ford joined Sohio in 1942 as a pumper in the department's Products Pipe Lines division and most recently served as station engineer.

•

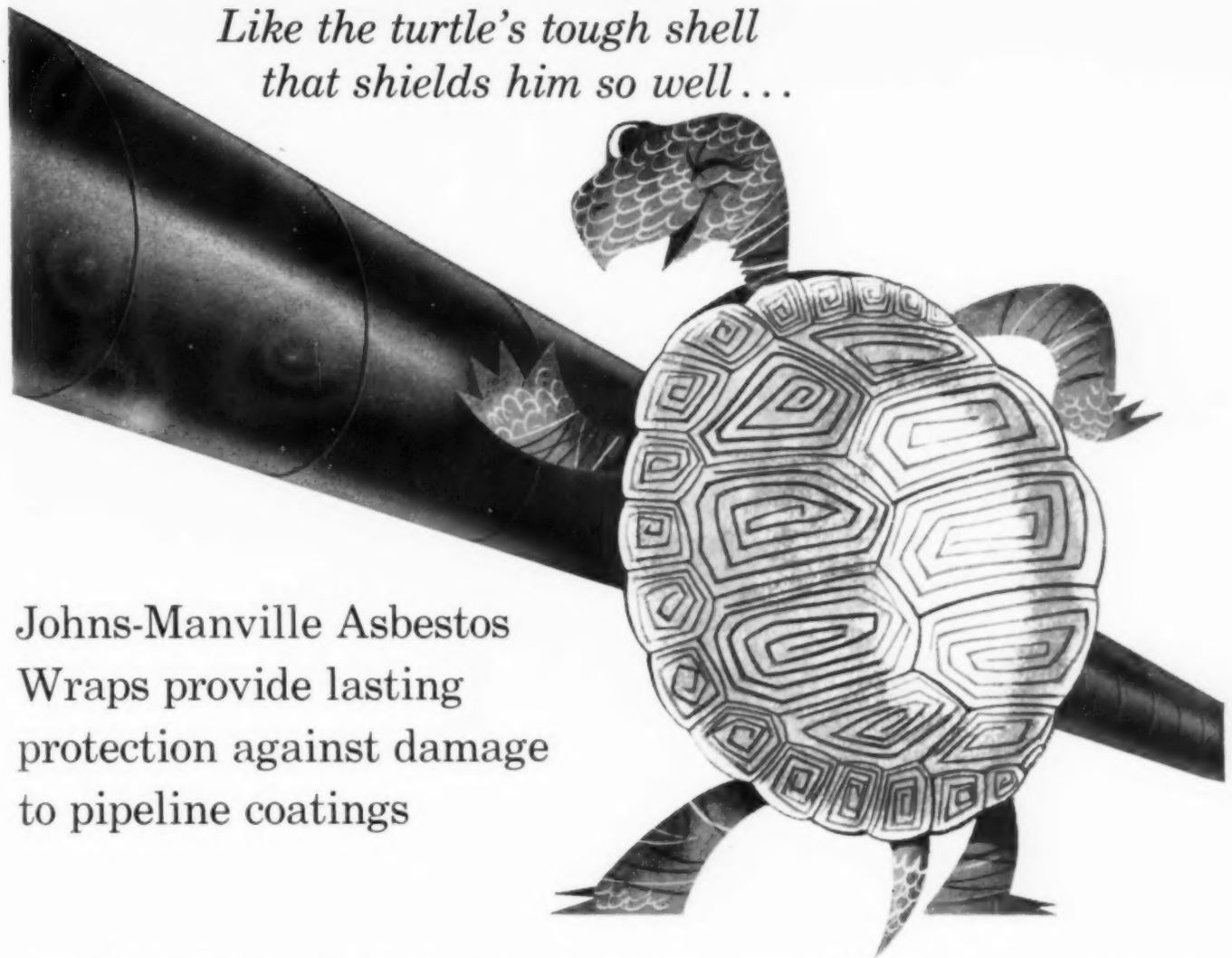
L. C. Davidson is transferring to Bartlesville to be general traffic manager in the consolidation of the Chicago and Bartlesville sections of the Traffic department of the Supply and Distribution division of **Cities Service Oil Co.** The consolidation follows the recent death of Paul Kelly who headed the Bartlesville section.

•

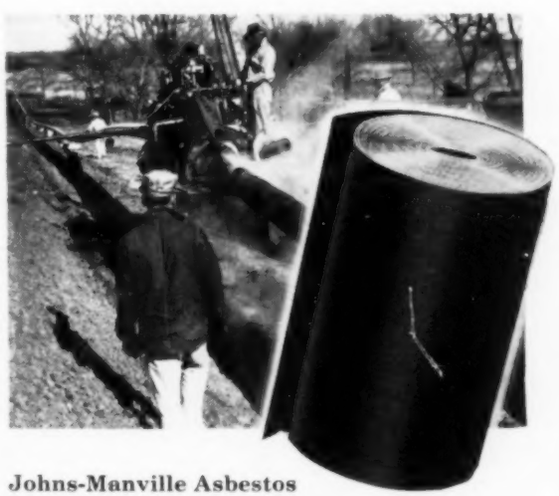
Donald M. Johnston is the new assistant general counsel and assistant secretary of **Trans-Canada Pipe Lines, Limited.**

Johnston has served as legal counsel

Like the turtle's tough shell that shields him so well...



Johns-Manville Asbestos Wraps provide lasting protection against damage to pipeline coatings



Johns-Manville Asbestos Felt is available in 3 types for field application or mill wrapping:

#15 Asbestos Felt—the high-strength, uniform asbestos wrap that has given superior protection to pipe coatings for more than 30 years—under the most severe soil conditions.

#15 Transhield®—heavyweight asbestos felt with parallel glass reinforcement for high tear strength.

#8 Transhield—standard-weight asbestos felt with parallel glass reinforcement—for low-cost protection against average soil conditions.

As far back as 1915, J-M Asbestos Wraps were being used to protect pipeline coatings. As a matter of fact, in the early twenties Johns-Manville also played a leading role in the development of equipment for mechanically applying protective coatings and wraps at the same time. The introduction of this equipment brought about uniform application of coatings and wraps . . . prolonged the effective life of protected pipelines.

Today, Johns-Manville Asbestos Wraps have a performance record of over forty years on job-proved installations representing nearly a quarter of a million miles of pipeline. And tests made recently by a leading firm of consulting engineers showed Asbestos Wraps provide the most effective single protection against earth loads, soil stress and other forces that weaken coatings and permit corrosion of the pipeline.

Invite one of our engineers to show you why J-M Asbestos Wraps have been the standard for the industry—and while he is with you, ask him to let you see the results of a three-year, extensive test program of "Pipeline Coatings and Wrappers." Write to Johns-Manville, Pipe Division, 22 E. 40th St., New York 16, N. Y.

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RESISTANCE TO SOIL STRESS AND DEFORMATION
HIGH-SPEED APPLICATION • LONG-TERM INVESTMENT
SIMPLIFIES CATHODIC PROTECTION SYSTEMS
REDUCES HAZARD • INCREASES SAFETY

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For more data on advertised products, use Readers' Service Cards, last page.

to the **California Standard Company** in Calgary for the past seven years. In his new position in Trans-Canada's Toronto office he will assist **N. John McNeill**, vice president.

•

Harry Rayson Lester, northern area gas superintendent for **Saskatchewan Power Corporation** for the past year and a half, has been promoted to provincial gas distribution superintendent.

Lester will supervise all natural gas distribution systems in Saskatchewan.

•

Thomas N. Banks, with **Southern Counties Gas Company** for 20 years, is the new Santa Barbara, Calif., division manager replacing **George W. Smith** who retired.

Banks is succeeded by **Monte S. Christie** as the San Gabriel Valley, Calif., division superintendent. Christie's former post as superintendent of the Santa Barbara division is filled by **Fred B. Bennett**, former distribution supervisor at the San Gabriel Valley division.

•

John E. Harbin and **E. Marion Shepherd** have been elected assistant treasurer and assistant secretary, respectively, of **Sun Pipe Line Company** at Beaumont, Texas.

Harbin has been promoted to the newly created position of accounting office manager and cashier for the Crude Lines department. He was formerly section head of the Accounting department. He has been with Sun since 1937.

Shepherd will assume Harbin's former duties and will retain his former classification of section supervisor. Shepherd joined the company in 1947.

•

W. J. Wilkins who has been with **Gulf Oil Corporation** for 26 years is the new president of **Laurel Pipe Line Company**, owned by Gulf, **Sinclair Pipe Line Company** and **The Texas Company.** Laurel was formed to build and operate an oil product line between the Philadelphia, Penn., and Cleveland, Ohio, districts.

W. J. Wilkins

Other newly elected officers are **R. D. Jackson, Jr.**, vice president and secretary; **M. W. Ramsey**, vice president; **C. C. Johns**, assistant secretary; **D. M. Hughes**, assistant secretary, and **Peter Affeld**, assistant treasurer.

Members of the board of directors include Wilkins, **J. L. Irvin**, Jackson, and Ramsey representing Gulf; **G. H. Giles, K. T. Feldman** and **D. S. Purnell** representing Sinclair, and **F. M. Dawson** and **J. W. Emison** representing Texaco.

•

D. H. Hushion is the new assistant chief engineer of the **Alberta Gas Trunk Line Company, Ltd.**, of Calgary, Alberta.

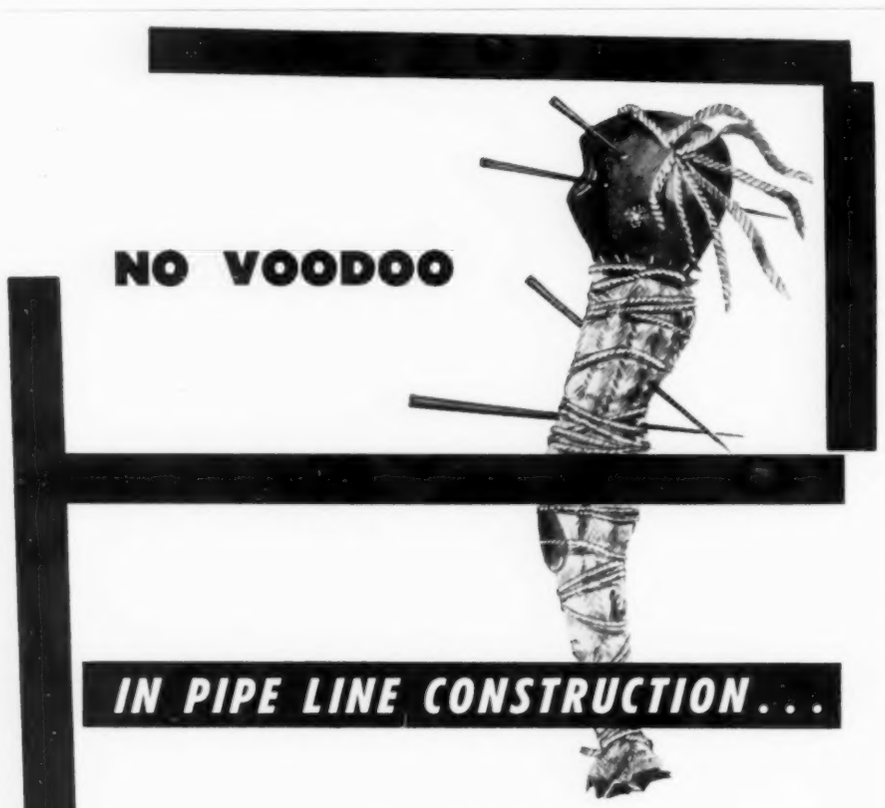
Other Alberta Gas appointments include **E. D. Haverland** who will be pipe line district superintendent with headquarters at Oyen, Alberta, and **C. T. McCall** who will be measurement superintendent with headquarters at Cavendish.

DEATHS

Charles E. Finney, Jr., retired president of Salt Lake Refining and Salt Lake Pipe Line Companies, died November 5 in Burlingame, Calif. Finney was a vice president of Standard Oil Company of California before his assignment to the Salt Lake Companies, Standard subsidiaries, in 1948. He joined the Standard organization in 1919.

D. M. McBride, manager of Phillips Petroleum Company's Supply and Transportation department, died November 1 in New York. McBride joined Phillips as a city sales agent in 1929. Funeral services were held in Bartlesville, Okla.

Roland R. Paulin, vice president and manager of operations of Michigan Consolidated Gas Company since 1950, died October 26 in Detroit, Mich. He joined the company in 1926 as a cadet engineer and was a resident of Grosse Pointe Park, Mich. Paulin was a past president of the Michigan Gas Association.



From original job estimate to final construction — the only "magic" involved in Sheehan's pipe line construction work is in *reliability* of performance.

It is the competency of Sheehan service — in the office and in the field — that provides profits for you in any area of pipe line construction — regardless of size of the job or the conditions encountered.

SHEEHAN PIPE LINE CONSTRUCTION CO. TULSA OKLA

Let Sheehan's experience work for you on your next pipe line project.

SHEEHAN

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PROBE

for atomic hydrogen under operating conditions

CORROSION CONTROL programs that require data on hydrogen diffusion in pipe-line or vessel walls will find the COSASCO Hydrogen Probe a valuable tool. Since it is installed through a COSASCO *Access* Nipple, it can easily be inserted or withdrawn at any time while vessel or line is on stream. It can be used to detect presence of free atomic hydrogen and to gauge rate of hydrogen diffusion by calibrating pressure rise within the hydrogen accumulation annulus.

The Hydrogen Probe is but one of the specialized COSASCO *Access* Plugs available for obtaining corrosion rate, cause and correction data. With them, corrosion coupons, water samplers, and thermocouples may be placed in transmission, storage, recovery or processing equipment without requiring shutdown because of pressures encountered.

COSASCO *Access* Nipples, through which entry is obtained, also permit important reductions in valve and other external equipment investments for wellheads, pipe lines and vessels. In addition, they increase safety ...now proved in industry-wide installations.

Is Operating Pressure Keeping You Out?

If you have an entry-against-pressure problem, COSASCO engineers can help you overcome it. Send details and blueprints depicting your problem and the COSASCO solution will be supplied promptly and without any cost to you whatsoever. *Write directly to COSASCO* Division of Perfect Circle Corporation, at the address below.

Protect equipment... Save product

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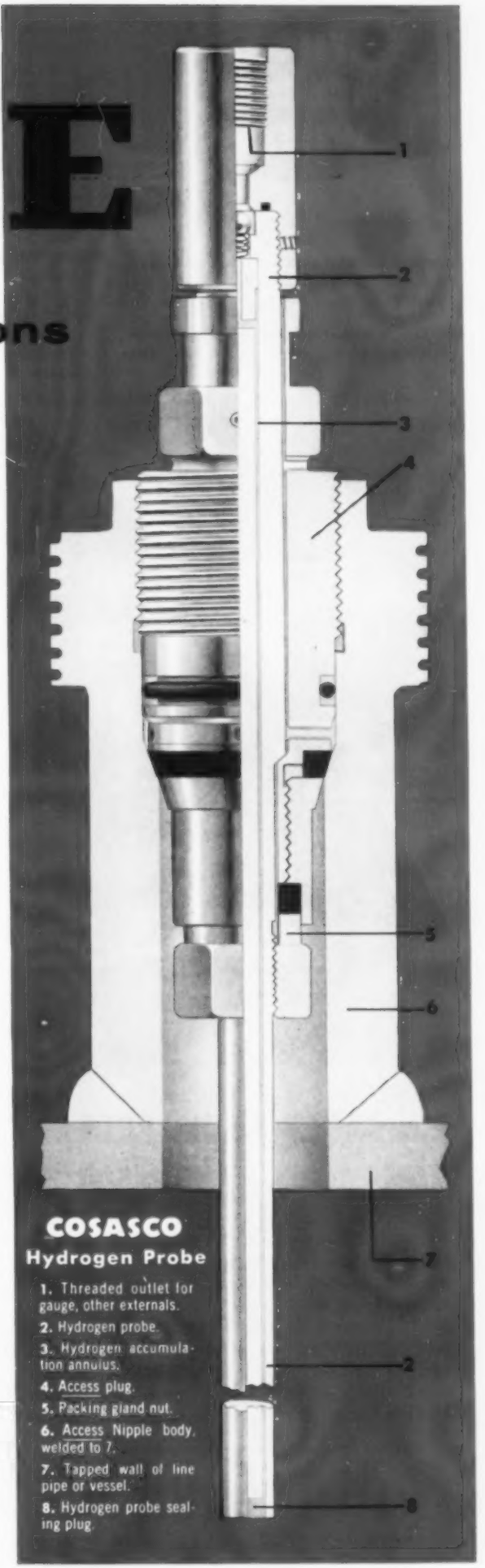

COSASCO
Hydrogen Probe

1. Threaded outlet for gauge, other externals.
2. Hydrogen probe.
3. Hydrogen accumulation annulus.
4. Access plug.
5. Packing gland nut.
6. Access Nipple body, welded to 7.
7. Tapped wall of line pipe or vessel.
8. Hydrogen probe sealing plug.

WHO'S MEETING WHERE

December

American Society of Mechanical Engineers, Annual Meeting, Statler Hotel, New York City, Dec. 1-6.

API Oil Information Committee meeting, Biltmore Hotel, New York City, Dec. 5-6.

American Institute of Chemical Engineers, annual meeting, Conrad Hilton Hotel, Chicago, Ill., Dec. 8-11.

Third Biennial Short Course on Cathodic Protection, University of Illinois and NACE, Urbana, Ill., Dec. 9-13.

January

Kansas Oil Men's Association, 43rd annual convention. Lassen Hotel, Wichita, Kansas, Jan. 12-14.

Tenth Annual Pipe Line Contractors Association Convention, Boca Raton Hotel and Club, Boca Raton, Fla., Jan. 19-22.

NACE Houston section practical short course for Pipe Liner's, University of Houston, Houston, Texas, Jan. 23-24.

Seventh Annual Instrument Short Course, co-sponsored by Southern California Meter Association and the Los Angeles Harbor Junior College, Jan. 30-31.

Natural Gasoline Association of America, regional meeting, Skirvin Hotel, Oklahoma City, Okla., Jan 31.

February

American Society for Testing Materials, committee week, Hotel Statler, St. Louis, Mo., Feb. 10-14.

National Association of Corrosion Engineers, short course for pipe liners, Mayo Hotel, Tulsa, Okla., Feb. 12-14.

Pipe Line Contractors Association of Canada, Fourth Annual Convention, Empress Hotel, Victoria, B. C., Feb. 20-22.

ASCE, pipeline division, Sherman Hotel, Chicago, Ill., Feb. 24-26.

Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Texas, Feb. 28.

March

Petroleum & Chemical Industries short course on gas conditioning, University of Oklahoma, Norman, Okla., March 5-6.

Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio, March 7.

NACE Annual Conference, Civic Auditorium, San Francisco, Calif., March 17-21.

New England Gas Association annual meeting, Hotel Statler, Boston, Mass, March 20-21.

American Congress on Surveying and Mapping & American Society of Photogrammetry, consecutive meetings and coexhibit, Shoreham Hotel, Washington, D. C., March 23-29.

Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo., March 24-26.

Oklahoma Utilities Association, Annual Convention, Biltmore Hotel, Oklahoma City, Okla., March 27-28.

American Petroleum Institute, Annual Pipe Line Conference, Jung Hotel, New Orleans, La., March 31-April 2.

April

Fifth Annual Conference on Corrosion Control, sponsored by University of Oklahoma, Extension Study Center, Norman, Okla., April 1-3.

Thirty-fourth Annual Gas Measurement, short course, sponsored by University of Oklahoma, North Campus, Norman, Okla., April 15-17.

Natural Gasoline Association of America, annual convention, Baker & Adolphus Hotels, Dallas, Texas, April 16-18.

American Institute of Mining, Metallurgical, & Petroleum Engineers, Louisiana-Arkansas, East Texas, & Mississippi petroleum sections, gas technology symposium, Shreveport, La., April 17-18.

Independent Petroleum Association of America, midyear meeting, Hotel Sherman, Chicago, Ill., April 27-29.

Third Annual Conference on Automatic Control in the petroleum & chemical industries, sponsored by University of Oklahoma, Oklahoma Memorial Union Building, Norman, Okla., April 28-29.

Southern Gas Association Annual Convention, Dallas, Hotel, April 28-30.

May

American Society of Mechanical Engineers, Oil & Gas Power Division 30th annual conference and exhibit, Philadelphia, Pa., May 12-15.

Less Breakage at Low Temperatures
COSTS LESS ON THE PIPE
Less Breakage Near Roll Core
Less Breakage From Quick Starts
Normal Curves At Straight-line Tension

PERRAULT 15 lb. FELT
Glass Fibre Reinforced

also...

Glass, Asbestos and Kraft Wrap . . . Rock Shield . . . Coating & Wrapping, Cleaning & Priming Machines . . . Tar Kettles, Patch Pots, Burners & Accessories . . . Pneumatic Inside Line-up Clamp . . . Pneumatic-tired Lowering-in Cradle . . . Pipe Cradles . . . Tongs, Sling Belts, Hooks, Clamps, Hand Tools, Supplies and Equipment of Every Sort.

Perrault fifteen-pound asbestos pipe wrap is reinforced with longitudinal glass fiber strands at one-fourth inch spacing. It costs no more delivered to the job, but by eliminating most shut-downs due to breakage, it costs far less on the pipe. Since it is not brittle when cold. Perrault reinforced felt is especially recommended for Fall and Spring Projects where material will be kept in unheated storage. Let us show you a sample and quote your next job. We also offer the best in other pipe wraps: Owens-Corning Glass, Kerr-McGee Outer Wrap, Kraft, and the original Rock Shield.

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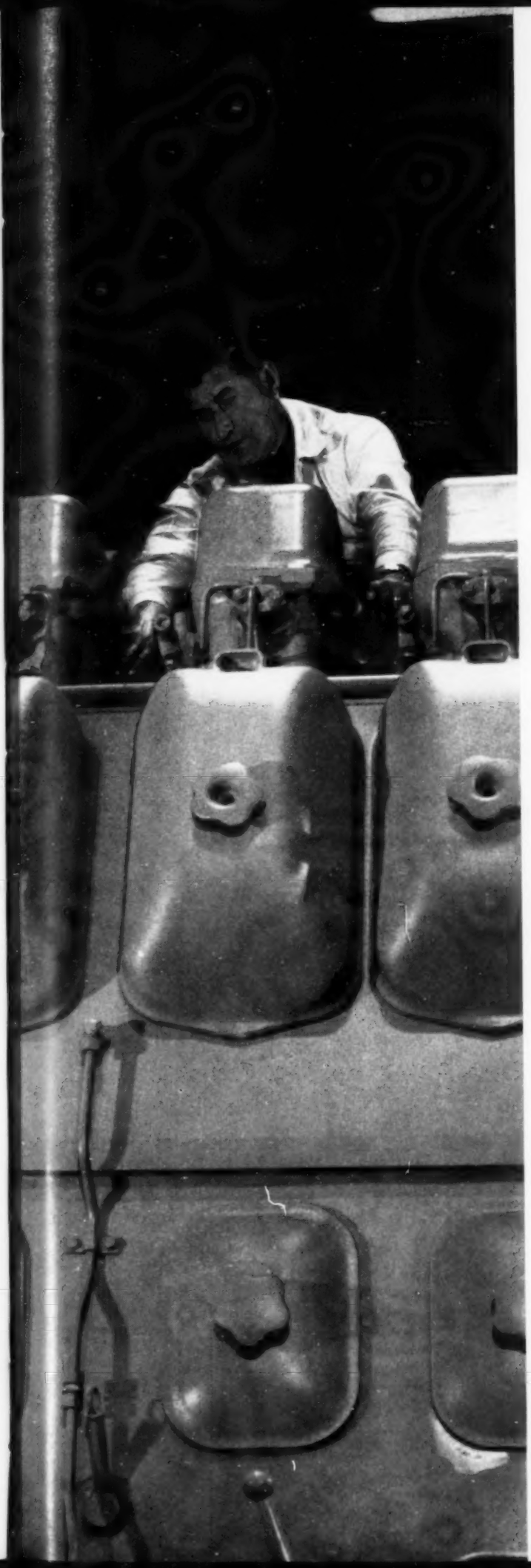

AN ENGINE AS MODERN AS TODAY

The ALCO 251 diesel is modern for good reasons. The first: To save you money. ALCO engineers designed this engine with up-to-date materials, lowering maintenance and slashing weight. Through modern turbocharging and fuel injection they endowed it with more horsepower — reliable horsepower — to drive pumps, compressors, generators, shafts efficiently and economically.

All this means that you can install ALCO engines inexpensively. Heavy costly foundations, grouting, are unnecessary. It means, too, that maintenance costs are lower because modern materials wear longer, and the 251 diesel's design lets your maintenance people get into the engine faster. Replacement parts are readily available from ALCO's six regional warehouses.

ALCO can tell you much more about how the 251 diesel compares to "cast-iron" engines. Contact your nearest ALCO sales offices, or write Transportation Products, Dept. TR-5, P. O. Box 1065, Schenectady 1, N. Y.

Condensed Specifications* for ALCO 251 Diesels

No. Cyl.	Bore and Stroke (in.)	RPM Range	BHP Range	Approx. Wt Dry (lb)
6	9 x 10½	350-1000	550-900	22,100
12	9 x 10½	350-1000	1100-1800	32,650
16	9 x 10½	350-1000	1470-2400	42,000

*DEMA standards

ALCO

ALCO PRODUCTS, INC.

NEW YORK

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Locomotives • Diesel Engines • Nuclear Reactors
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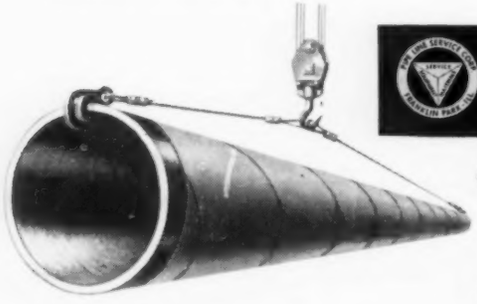
Pipe Protection

strategically located

to save you time and money!

Pipe Line Service has eight fully equipped wrapping plants to serve the major steel pipe producing areas in the country! These eight modern plants are strategically located to serve you as the pipe leaves the tube mills, en route to destination, or at a plant in your operating area. Strategic location is more than just convenience—it means substantial savings in storage and handling, lower through-freight costs, and less delivery time to jobsite.

What's more, these plant locations mean that, wherever you buy your pipe, you can get a uniform coating and wrapping job at a nearby PLS plant—no long shipping delays. If needed, you can have pipe wrapped at more than one PLS plant, delivered to the same jobsite, and be sure there is no difference in quality. Call in your nearest Pipe Line Service representative on your next coating job—he'll show you how PLS can give you the finest in pipe protection and still save you time and money.



Pipe Line Service Corporation

FRANKLIN PARK, ILLINOIS

Quality pioneers in coating and wrapping pipe for a quarter century

There's a PLS plant strategically located to serve YOU!

What's Happening among SERVICE and SUPPLY MEN

R. F. Gibson

E. R. Hester

Gibson, Hester New Managers At Nordberg Manufacturing

Robert F. Gibson is the new manager and E. Ray Hester is assistant manager of the Installation and Service department of Nordberg Manufacturing Company's Engine division.

Gibson served as assistant manager of the department since December, 1951, and recently completed his eighth year with the company.

Hester has been with Nordberg 21 years. He assisted in the department's administration for the past eight years and previously supervised engine installations.

Thew Shovel Company Advances Three Management Personnel

D. L. Douglas, recently appointed parts and service manager of the Thew Shovel Company, has been advanced to director of parts and service. Douglas started with Thew in 1955 as parts sales manager and was made manager of the Parts division in January, 1957.

Carol G. Turk assumes the position of assistant to director of parts and service. Turk came to Thew in 1956 as coordinator of staff functions between Engineering and Service departments.

R. G. Thibaut, who has been manager of the Service department for the past four years, continues as the active head in charge of detailed operations.

W. C. Cheek

J. H. Loomis

Worthington Corporation Lists 3 Marketing Personnel Changes

Three promotions in the Marketing division of Worthington Corporation have been announced.

H. H. Wise

William C. Cheek is the new midwest regional sales manager. He has been with Worthington since 1920 and was Chicago district office manager before his new appointment.

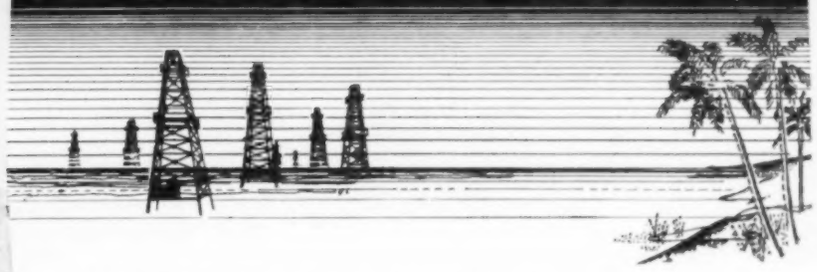
John H. Loomis replaces Cheek in Chicago. He joined the firm in 1945 and has been serving as manager of the St. Louis district office.

Taking over Loomis' former position is

PIPE LINE TRENCHING

16/60 Model Trencher digging in hard sand

in the MIDDLE EAST



Engineers in oil-producing countries know the best machines for the job. For trenching, they specify ALLEN—a name renowned for reliability, freedom from costly breakdowns, and ease of maintenance. In hot, dusty conditions, ALLEN trenchers slog on, day in, day out, standing up to years of continuous hard work—they have no equal anywhere.

Three models are available, the 12/21, the 16/60, and the new 14/30 for medium size trenches.

ALLEN TRENCHERS

Illustrated catalogues and technical data on request.

JOHN ALLEN & SONS (OXFORD) LTD · COWLEY · OXFORD · ENGLAND

For more data on advertised products, use Readers' Service Cards, last page.

Hollis H. Wise who has been serving Worthington as a resident general line salesman out of Indianapolis. He has been with the firm since 1938.

U. S. Steel's "Oilwell" Makes Four Appointments

The appointment of Thomas L. Campbell as assistant manager tubular sales at Los Angeles for U. S. Steel's Oilwell Supply Division has been announced. Mr. Campbell was employed in 1937 at Wilmington, Calif.

Richard C. Sennett has been appointed assistant district engineer, machinery and equipment sales and service, Wichita Falls, Texas. Sennett was employed in 1956 by "Oilwell" as a junior engineer at Corpus Christi, Texas.

Henry W. Harless has been appointed store manager and field representative at McCamey, Texas. Harless was employed by "Oilwell" in 1954 at Odessa, Texas and became the division's field representative at this location in 1955.

Allen C. Heard, appointed field representative, was employed by the division at Odessa in 1950. He was appointed field representative at this location in 1952 and in 1955 was named manager of the "Oilwell" store at McCamey.

John O. Fighter Joins Cooper-Bessemer International

The appointment of John O. Fighter to Cooper-Bessemer International has been announced. A graduate in Engineering Administration from Case Institute of Technology, Fighter joined The Cooper-Bessemer Corporation immediately upon leaving engineering school. He received his advanced compressor engineering training at the company's main plant in Mount Vernon, Ohio.

Condry Will Head New Orleans Corrosion Rectifying Office

With the opening of a new Southeastern division office at New Orleans, Corrosion Rectifying Company now offers headquarters service from Houston and branches at Great Bend, Kansas, and New Orleans.

J. T. Condry

James T. Condry, with headquarters at 2322 Airline Highway, Kenner (New Orleans), Louisiana, will direct the evaluation, design, installation and materials sales in the Louisiana and neighboring areas. He has had extensive experience in cathodic protection work for Service Pipe Line Co. and with consulting firms.

Manor Named to Direct Rockwell Valve Research

Paul A. Manor, chief engineer of Rockwell Manufacturing Company's Barberton, Ohio, Valve division, has been promoted to chief engineer, Central Valve Research and Development department at Pittsburgh. Manor joined Rockwell in his most recent capacity in 1954, after 10 years as chief project engineer of Surface Combustion Corporation at Toledo, Ohio.

Allis-Chalmers Manufacturing Appoints Silver General Attorney

Harold S. Silver has been named general attorney for Allis-Chalmers succeeding Harold W. Story, vice president and general attorney, who has retired after 38 years' service with the company. Silver had been the company's general patent attorney since 1946.

Appointment of Henry F. Banzhaf as assistant to the general manager of the General Products division has been announced. Banzhaf came to Allis-Chalmers in 1950 and since 1953 had been manager of sales of the firm's control department.

A. O. Smith Corporation Names T. C. Ficken New Sales Manager

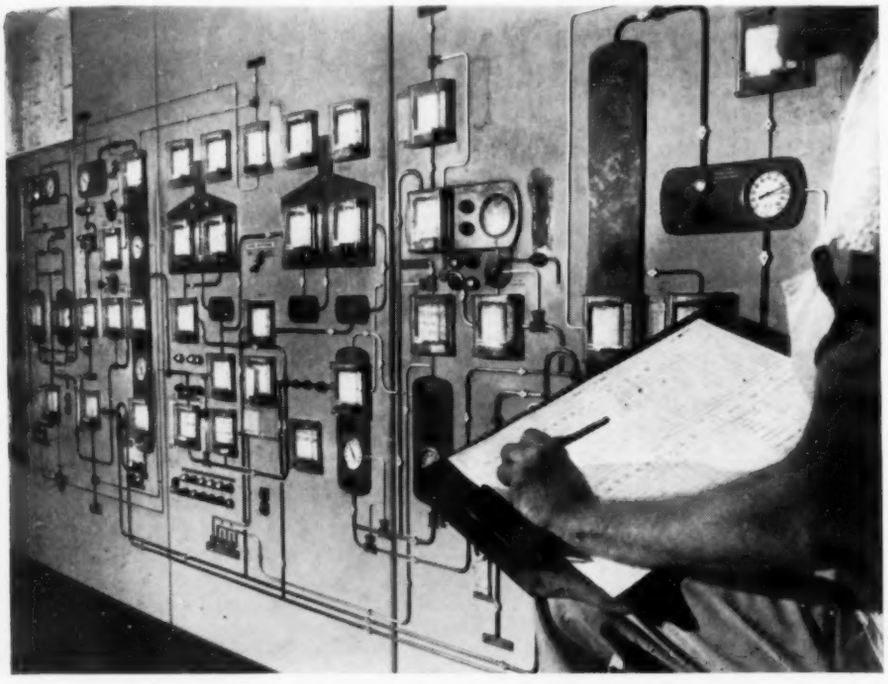
T. C. Ficken has been appointed sales manager of the southeastern U. S. for the Meter and Service Station Pump divisions of the A. O. Smith Corporation.

A former sales representative in the area, Ficken will continue to headquarter in Atlanta, Ga.

Bristol Opens New Office, Promotes Engineer Personnel

The Newark, N. J., sales and service staff of The Bristol Company has moved into new, enlarged offices. The new headquarters are at 744 Broad Street. Branch manager for the office is R. C. Bechert.

The Bristol Company has named Walter



To keep 'em reading right . . .

Come to Kemp

Get increased precision and longer life by protecting your air-operated instruments with Kemp Oriad Dryers. Kemp dryers clean and desiccate air supplies to stop condensation, corrosion and jamming.

In operations across the country, Kemp Oriad Dryers are giving dependable performance, year after year, with only routine care and maintenance.

Your Kemp Representative will show you how *your* instruments can get maximum protection at minimum cost. Or write us direct for Bulletins D-102 and D-103. The C. M. Kemp Mfg. Co., 405 E. Oliver St., Baltimore 2, Md.

KEMP OF BALTIMORE

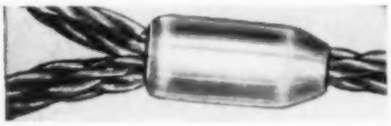
Available in all sizes for automatic, semi-automatic, or manual operation. Steam or electric reactivation.

Only 2 Pounds of Tuffy Sling Per Ton of Load

The slings hoisting this hydraulic press are 1¼" Tuffy U-1s. For each 2 pounds of their own weight, two Tuffy U-1s of this length (basket hitch) are rated to handle a ton of load. Pound for pound Tuffys are weight lifters extraordinary.

The secret of the amazing strength of all Tuffy Slings is in the special purpose steel we use, and the way its wire fabric is machine-braided to give a combination of toughness and flexibility you won't find in any other machine made sling.

Tuffy Slings are so flexible that kinks can be pounded out easily without sling damage. And it's mighty hard to kink a Tuffy Sling in the first place. Tuffy's resistance to knotting, kinking and looping is just one reason why Tuffy Slings have an enviable record of giving longer service life than ordinary slings. For another reason, look at the Tuffy ferrule . . .



Tuffy's pressed-on ferrule gives the tucked eye splice 100% of fabric strength. Applied under great pressure, the steel ferrule literally flows into every space between the wires and strands, developing friction force equal to fabric strength. Another reason why you can't match Tuffy for taking deadloads, shocks and impacts!

Your Tuffy Distributor is Stocked to Meet Your Needs

He'll help you save money with the longer trouble-free service life of Tuffy Slings. He's ready with your Tuffy Slings and Union Wire Rope needs. Get in touch with him now!

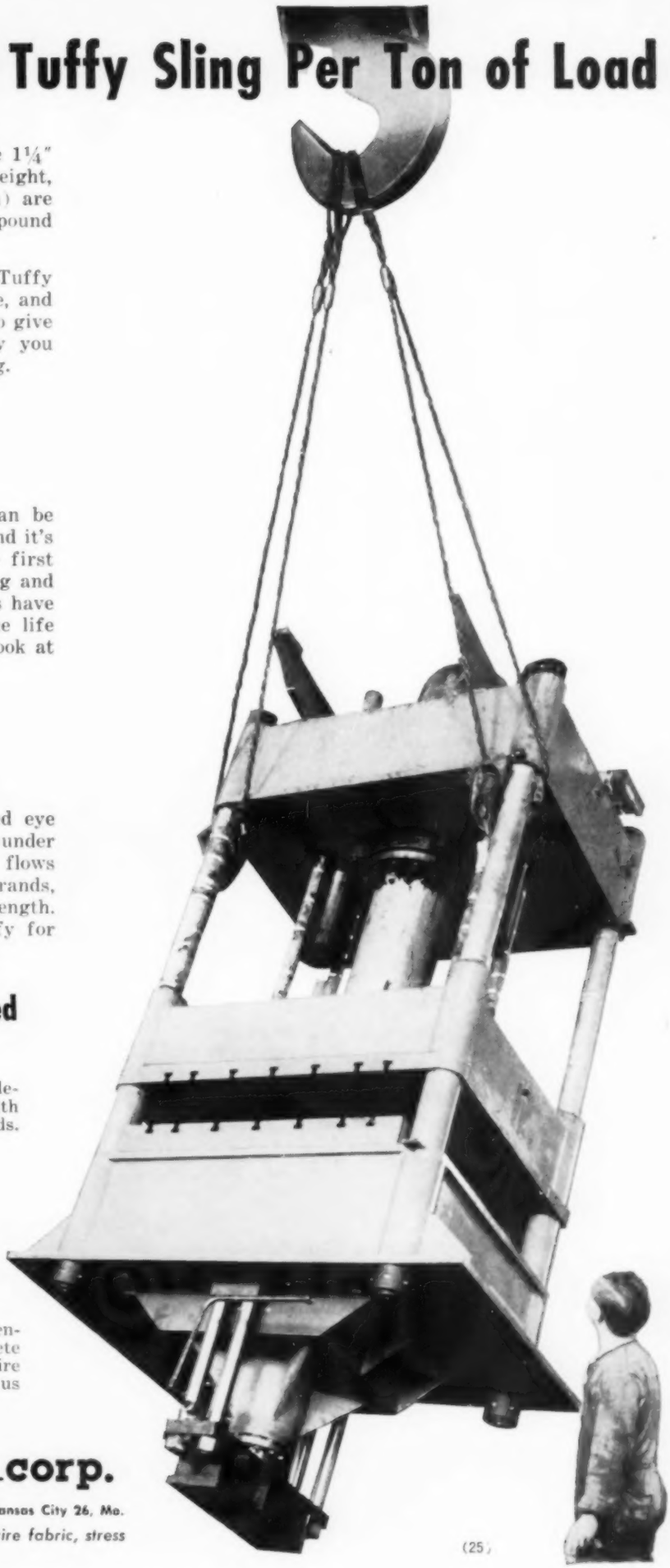
FREE— Get Your Tuffy Sling Handbook

Gives complete data on Tuffy Sling types, dimensions, weights and rated loads. Plus a complete rigger's manual and engineer's notebook on wire rope constructions and specifications. Write us for your copy!

union Wire Rope corp.

2278 Manchester Avenue, Kansas City 26, Mo.

Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand



(25)

For more data on advertised products, use Readers' Service Cards, last page.

NATIONAL LINE PIPE

reaches across America...

SEAMLESS AND ELECTRIC WELD

UNITED STATES STEEL

The world's finest tubular products from the best-known name in pipe—National Tube

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

E. Rufleth as manager of telemetering systems applications and Kenneth R. Neale as manager of electronic products applications. Both men will continue to operate out of the Application Engineering department, at the company's Waterbury, Conn., headquarters.

Garlock Packing Makes Two Sales Appointments

V. L. Moore has been named sales engineer of the territory including Los Angeles County and vicinity for The Garlock Packing Company. Moore succeeds R. J. Young who retired in June.

Eugene G. Flannery has been appointed district manager for the Philadelphia branch. Flannery, who has been with the company 14 years, was formerly district manager of Garlock's Pittsburgh office and replaced Charles F. Palmer, Jr. who has been named to head the Chicago sales office.

Rives, Dyke Appointed PESA Advertising Agency

Rives, Dyke and Company of Houston has been appointed advertising agency for the Petroleum Equipment Suppliers Association (P.E.S.A.). The association is composed of 150 oil industry manufacturers, service firms and supply companies.

Rockwell is New Member Of National Committee

Willard F. Rockwell, Jr., president of Rockwell Manufacturing Company, has been named to the Manufacture and Industrial Development Committee of the U. S. Chamber of Commerce.

Rockwell is president of the Pennsylvania State Chamber of Commerce and is vice president of the Pittsburgh Chamber of Commerce.

Darroch Is President

Incoming president of Canadian Gas Association, Herbert C. Darroch of Toronto, Ont., greets retiring president F. R. Palin of Chatham, Ont. Darroch is president of Moffats Limited, Canada appliance manufacturing company.

Granberg Corporation Names Hessin To Sales Engineer Post

W. J. Hessin has been appointed sales engineer for Granberg Corporation and will work in the firm's national headquarters at 1308 67th, Oakland, Calif. His duties will consist of coordinating Engineer and Sales department functions for the company's pumps, meters and accessories.

Youngstown Sheet and Tube Makes Two Superintendent Promotions

Fred E. Theis and Norman P. Hitchcock are new superintendents of shops, and maintenance and power, respectively, at the Indiana Harbor Works of Youngstown Sheet and Tube Company.

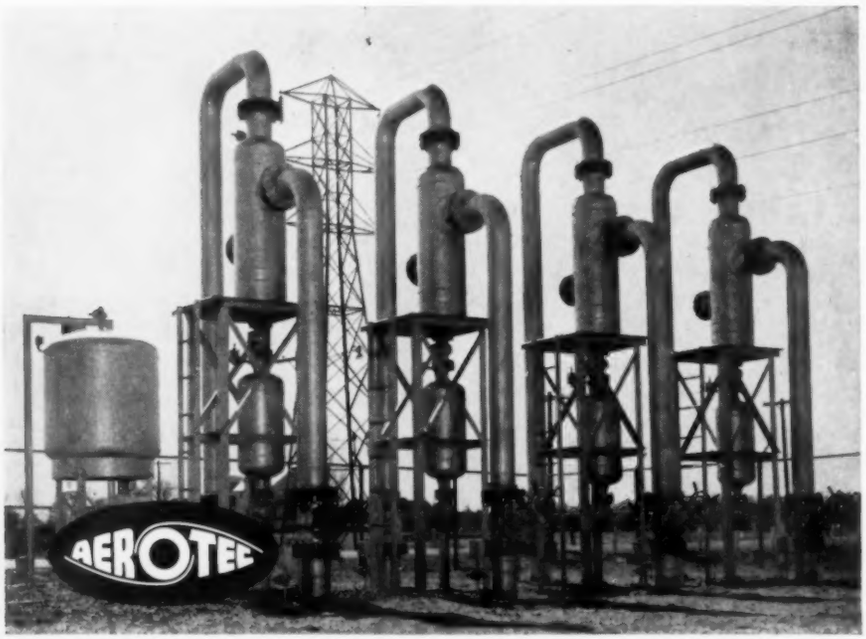
Theis started his Youngstown career in 1937 in the carpenter shop at the Campbell Works and advanced to shops planning engineer.

Hitchcock joined the company in 1933 as a power house repairman and served the firm most recently as assistant superintendent of maintenance.

Adams Is New Vice President Of United States Steel Corp.

The appointment of Phelps H. Adams as vice president in charge of public relations of United States Steel Corporation was recently announced.

He has been executive director in charge of public relations and assistant to the chairman of the board since January, 1956. He joined the firm in 1950 as a special assistant in the Public Relations department. Prior to this Adams was chief of the New York Sun's Washington bureau.



cleaning gas without wetting agents

These four Aerotec Gas Scrubbers, operating in parallel, were installed by a large utility to clean the gas at the entrance to the Albany, New York distributing station.

Dry clean gas is a necessity at this critical point, and these units have been serving the community for several years with no liquid carry-over. They operate on the principle of centrifugally removing solid and liquid contaminants from gas, a method in use for many years in dust control.

Aerotec Dry Gas Scrubbers are serving the industry on practically every major gas line today. Their outstanding performance presents an unexcelled record and their comparatively small size simplifies installation in limited space.

Our Project Engineers have a background of experience in solving gas scrubbing problems that will be valuable to you.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.
(Offices in 38 principal cities)
Canadian Affiliates: T. C. CHOWN, LTD., 164 Metcalfe Ave., Westmount, Montreal 6, Que.

Manufacturers
THE AEROTEC CORPORATION
Greenwich, Conn.

Now! Super-efficiency with Economy

The new Wheaton Type 680 LOADERS

- Shockless loading valve
- Remain in loading position automatically
- Regain out-of-service position automatically, without shock
- Feature highest quality fittings

Also available in Type 683 for direct mounting to overhead tanks or piping. Call or write for complete information on faucets, valves, loading assemblies, vents and fittings.

SIZE	A	B	C	D	E
2"	83"	125"	48"	6"	11"
2½"	83"	125"	48"	6⅜"	12"
3"	88"	134"	48"	8½"	12"
4"	94"	139"	48"	10"	13"

SERIES 680 LOADERS ARE THE MOST ECONOMICAL SPRING BALANCE ASSEMBLIES OFFERED TO THE PETROLEUM INDUSTRY. When in use, they remain in the tank manhole during loading operation without being held down. When loading operation is completed, the assembly can be lifted to the horizontal where the power of the preset springs carry the assembly to any desired angle from 10° to vertical.

The fittings composing the Type 680 Loading Arm are standard equipment, retaining the superior qualities of shockless loading, long wear, easy maintenance. All swing joint seals are readily replaceable without breaking any threaded connection. This equipment is the most flexible and economical offered the oil industry.

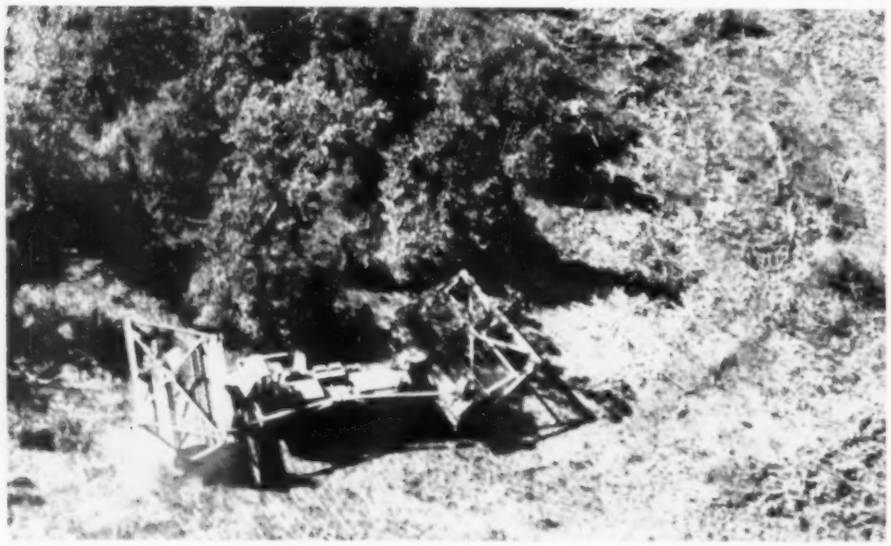
WHEATON BRASS WORKS
UNION, NEW JERSEY

Manufactured also by:
EMCO LIMITED, LONDON, ONTARIO, CANADA
EMCO BRASS MFG. CO., LTD., WESTWOOD INDUSTRIAL ESTATES, RAMSGATE ROAD, MARGATE, KENT, ENGLAND
WORTHINGTON S.A. (MAQUINAS), RUA SANTA LUZIA, 685, RIO DE JANEIRO, BRAZIL, S.A.

Represented in Mexico by:
MR. ENRIQUE A. TESSADA, 1510 PASEO DE LA REFORMA, MEXICO CITY, D.F., MEXICO

DISTRIBUTORS IN ALL PRINCIPAL CITIES

What's New in EQUIPMENT



Tree Crusher

R. G. LeTourneau, Inc. of Longview, Texas, has introduced a giant new tree crusher which can clear an acre of land every 15 minutes. It has proved its strength by wrecking giant oaks which are 12 feet in circumference.

Right of ways, roads, farm lands, reservoirs or pasture land can be cleared quickly and economically even in jungle areas.

Although the crusher has the wallop of six heavy crawlers, it is operated by only one man. Perched in a cab high above the rollers, the operator feeds power and steers with simple push-button type controls.

The machine is 74.3 feet long, 22 feet wide and 19 feet high. Diameter of the rollers is nine feet. Weighing in excess of 140 tons, the equipment can cut a path 49 feet wide through the most dense underbrush.

Extending from the rollers are more than 300 heavy cleats shaped similarly to conventional axe blades. When the machine is pitted against giant-sized trees, the front roller climbs the trunks until it has leverage enough to push the trees over. The machine's axe-like teeth crush a fallen tree as it crashes to earth.

For more data, circle **No. E1** on Readers' Service Card, last page this issue.

Thickness Gage

Industrial Nucleonics Corporation of Columbus, Ohio, manufacturers of AccuRay Production Control Systems, has announced the first of a new line of products for the process industries.

The new equipment item is an AccuRay Portable Pipewall Thickness Gage which permits quick, easy, nondestructive pipewall thickness measurements.

Completely transistorized, the gage weighs 7½ pounds and measures absolute pipewall thickness directly on pipes ranging from two to eight inches nominal in diameter. The measurement unit gives a reading independently of pipe diameter and maintains a permanent calibration.

Since the principle of radiation absorbtion is used, nonferrous or plastic piping in the ranges specified may be measured.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

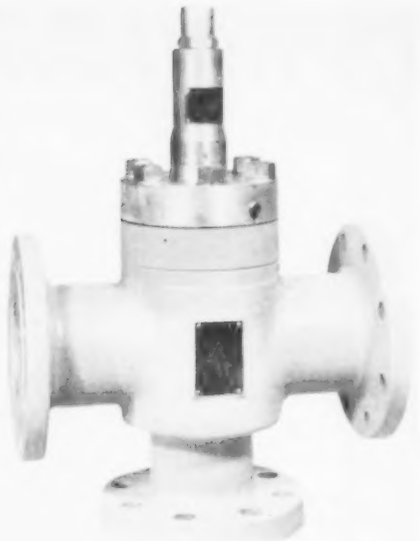
Communication Units

General Electric Company has announced that it will market several new types of radio communication units designed to improve safety aboard ocean-going vessels and to provide short-range communication for all types of vessels such as tugs and other smaller craft.

Smith-Meeker Engineering Company, marine engineering firm of New York, will be a distributor for the new equipment.

(This item supplements General Electric Co. data on Pages 181-188 of the Pipe Line Composite Catalog, 1st Edition.)

For more data, circle **No. E3** on Readers' Service Card, last page this issue.



Relief Valve

A new type soft seat pilot operated relief valve for gas or vapor service at pressures up to 1500 psig has been announced by Anderson, Greenwood and Co. of Houston. Full capacity is obtained with zero overpressure or accumulation.

Basic operating part of the AGCO Type 2 Valve is a free floating piston of differential area design. Pressure on the upper or larger surface of the piston is reduced by venturi action when the small spring loaded pilot opens, allowing the piston to rise and the valve to relieve.

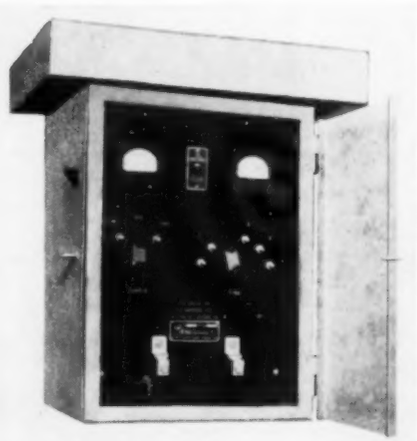
For more data, circle **No. E4** on Readers' Service Card, last page this issue.

Protection Rectifier

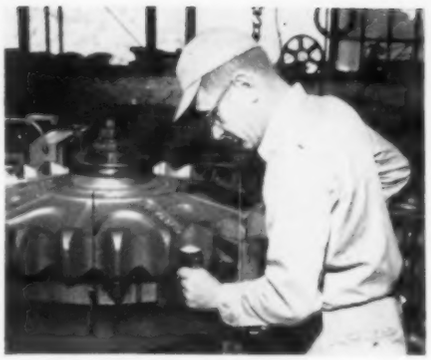
A new model cathodic protection rectifier has been announced by Rio Engineering Company.

The equipment features an easy-to-change voltage tap system which requires no tools and a removable side panel which gives immediate access to all components. The line has been designed with the corrosion engineer's requirements in mind and is as nearly maintenance-free as possible.

Manufacturer has available air-cooled, oil-immersed and explosion-proof models.



For more data, circle **No. E5** on Readers' Service Card, last page this issue.



Sprocket

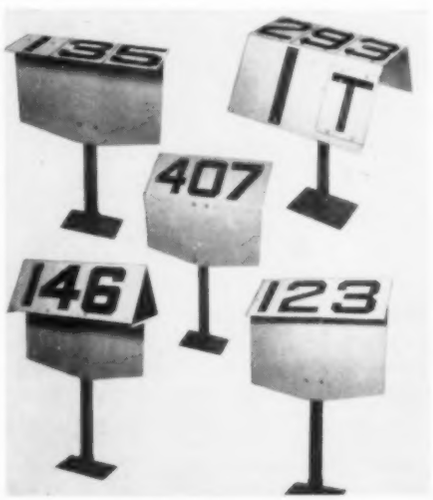
An innovation in modern metallurgy promises good news to owners of earth-moving equipment. Setting an industry precedent, the element boron is being used to measurably increase the life of crawler tractor sprockets.

Marketed under the trade name Boralloy, these sprockets are now standard equipment on Caterpillar D8 and D9 Tractors. Boralloy replacement rims are available for D8 sprockets.

Representing the first commercially successful attempt to produce boron-bearing cast carbon steel by the acid open hearth process, the Boralloy sprocket was developed as a cooperative research project between Caterpillar Tractor Co., Peoria, Ill., and Harrison Steel Castings Company, Attica, Ind.

(This item supplements Caterpillar Tractor Co. data on Pages 67-69 of the Pipe Line Composite Catalog, 1st Edition.)

For more data, circle **No. E6** on Readers' Service Card, last page this issue.



Pipe Line Markers

A new concept in aerial pipe line marker designs has been presented by Gleason Romans Pipe Line Patrol Company. The markers feature a greater amount of flat-plate equivalent area, from horizontal to 45 degrees off vertical for greater visibility.

Less material and manufacturing costs are realized over previous designs. A variety of configurations are available with choices of enamel or porcelain, or a combination of porcelain numbers and enamel flat plate area.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.

Joe Roughneck's solid source of supply...

API CASING | API TUBING | API LINE PIPE

Wheel of plenty! Welding pipe by electric resistance weld process. Lone Star API pipe is fully normalized.

Joe Roughneck, of course, is symbolic of the men who have made the fabulous oil and gas industry tick . . and Lone Star Steel's huge completely integrated plant is right in the middle of Joe's workshop. Lone Star pipe is quality-controlled from mining of ore to finished pipe. In addition to operating day and night to supply Joe's pipe needs . . Lone Star is building new and even larger facilities.

Neighbor, wherever you are, specify Lone Star and we both get a good deal!

Lone Star STEEL COMPANY

EXECUTIVE-SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas

DISTRICT SALES OFFICES
Houston, Texas | Midland, Texas | Dallas, Texas
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

Opens 25 feet per minute

With a wide selection of 30 digging speeds, Parsons 150 wheel-type Trenchliner delivers maximum trench production in any kind of soil — speeds cross-country transmission lines, feeder and gathering systems. It opens from 12 inches to 25 lineal feet of trench per minute, digs 5¾ feet deep, 16 to 26 inches wide — with precision grading accuracy. For instance —

Hydraulic rams control wheel

A hydraulic ram on vertical mast raises and lowers the digging wheel with fractional-inch accuracy — holds to close grade tolerance at any desired depth. A second ram controls the tilt of the mast, balances wheel weight forward on machine when traveling and trailer-loading. Mast eliminates cumbersome superstructures, gives better accessibility, reduces overhead clearance, and improves visibility for the operator. Dual-purpose friction clutch drives the digging wheel — and automatically slips when overloaded. This protects machinery against sudden shock-loads. Buckets are cast steel, long-wearing in tough digging. There's extra work-life, too, in Parsons self-sharpening, reversible "Tap-In" teeth. Shiftable, reversible belt conveyor deposits spoil on either side of trench.

Three types of crawlers are available for work and travel over any surface. Standard grouser-type crawlers have 16-inch treads. For street travel, optional street pads can be added. For special jobs, the 150 has optional 12-inch flat shoes. You also have a choice of standard-make gas or diesel engine. This lets you fit the 150 Trenchliner right in with other equipment in your pipeline spread — simplifies maintenance programs.

Your Parsons distributor can give you all the facts on this 150 Trenchliner. See him, or write to us for a free catalog. Parsons line also includes: "big-inch" and "middle-inch" wheel-type Trenchliners; ladder-type Trenchliners; utility-size, rubber-tired Trenchmobile®.

P7003 PI

mail to:

PARSONS DIVISION, NEWTON, IOWA
KOEHRING COMPANY

Send us literature on the 150 Trenchliner.

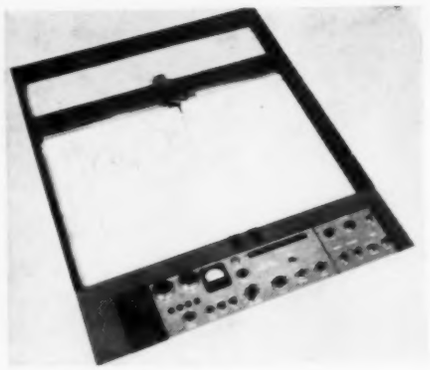
NAME_____ TITLE_____

COMPANY_____ DIV._____

STREET_____

CITY_____ STATE_____

PARSONS TRENCHLINERS®
A division of Koehring Company



Electronic Graph

Electronic Associates, Inc., have introduced an automatic graph maker, the Dataplotter, a machine for making automatic graph pictures of information and data from electronic business computers and for keeping a constant graph record of business operations.

The Dataplotter makes it possible to decipher the numerical calculations from high speed digital electronic computers now used by business. Within one and two-thirds seconds the machine can pick up information from a punched card, punched tape or magnetic tape, store the information in its electronic memory device, pick up information from a second punched card or tape, call back on his memory device for the first point and then draw a continuous line between the two points.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Utility Welder

A new general utility type welder designated as M-180-P has been announced by Miller Electric Manufacturing Company, Inc., of Appleton, Wis.

Continuous, precise and fingertip current control is provided by a new movable shunt regulator. Accurate amperage indicator on panel gives correct setting for each job.

Other features include two welding current ranges, power factor correction for full compliance with REA requirements and extra-heavy gage steel body with baked enamel finish. Carrying handles add easy portability to the 137 pounds.

Standard equipment includes six feet of three-conductor primary cable with three-prong plug and wall receptacle, 20 feet of number four electrode cable with electrode holder, 15 feet of number four ground cable with clamp, and welding helmet and five pounds of assorted electrodes.

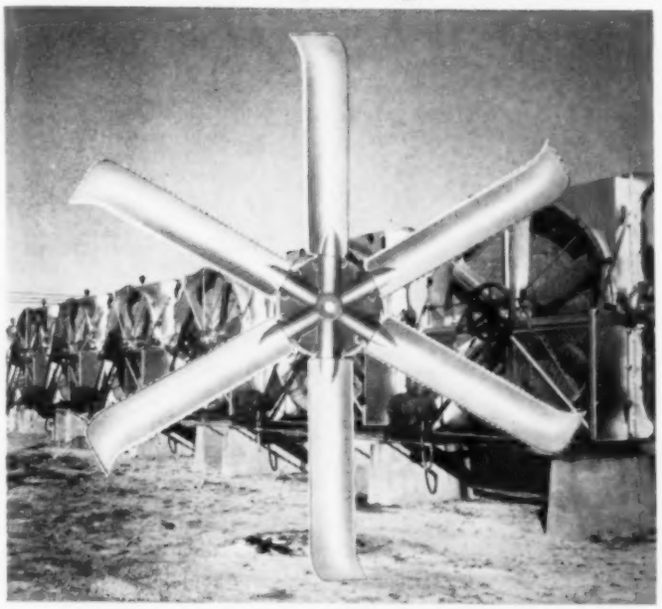
For more data, circle **No. E9** on Readers' Service Card, last page this issue.

new adjustable pitch

"macheta" airfoil

Aerovent

54"–96" propellers



now available in

'T-ALLOY'

Acclaimed as *industry's most efficient air-moving* surface, Aerovent "Macheta" Airfoil Propellers are leading the way in cooling tower and heat exchanger fan design and engineering.

Latest innovation is the use of "T-ALLOY" for extra strength and additional corrosion resistance in especially rugged applications. Inherently a high-strength alloy, "T" provides better resistance to shock and vibration. This, plus *individual blade balancing* for complete interchangeability of all units and *universal pitch markings* to simplify accurate field setting, is your assurance of dependable, lasting performance in any installation.

STANDARD CONSTRUCTION ALUMINUM-ALLOY BLADES FURNISHED FOR ALL NORMAL-DUTY REQUIREMENTS

CAST ALUMINUM HUBS for light weight and ease of handling feature bolted construction for fast, easy assembly.

"POSITIVE-LOCKING" Pitch Adjustment is accomplished by keyways which hold peripheral-keyed blade shanks.

Write for free bulletin 500

Aerovent FAN COMPANY, INC.

LARGE PROPELLER DIVISION

304 Wright Bldg. TULSA 3, OKLA.

Main Office and Factory PIQUA, OHIO

As SIMPLE and Dependable as the Pull of a MAGNET!

A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol.

MAGNETROL

in

The Simplest, Most Versatile LIQUID LEVEL CONTROL Ever Devised!

Linked to liquid level by infallible magnetic force, Magnetrol is free from the limitations inherent in mechanical or electrical controls. With the actuating magnet rated at 98% of initial strength after 30 years, Magnetrol has *infinite operating life*, with practically no maintenance at all. There are no wearing parts to get out of order.

What's more, Magnetrol's simple operating principle permits easy, economical modification of standard units to meet *any* pressure, temperature or corrosion requirements. That's why there's practically no limit to Magnetrol's use. It's also why "specials" are likely to be standard with us. Magnetrol units control level changes from .0025-in. to 150-ft. —with single or multi-stage switching.

MAGNETROL, Inc.

● SEND COUPON FOR DETAILS

MAGNETROL, Inc. 2128 S. Marshall Blvd., Chicago 23, Illinois

Please send me catalog data and full information on Magnetrol Liquid Level Controls.

Name_____

Company_____

Address_____

Zone_____ State_____

Extra flotation and traction and precision load-handling win key assignments for TD-24 Superior Sideboom performance—on the 79-mile stretch of Trans-Canada Pipeline Company's natural gas line from Upsala to Port Arthur, Ontario. Contractor: Houston Contracting Co., Houston, Texas.

Backfilling for Houston Contracting Company—this torque converter TD-24 with cable Bullgrader is shown 'dozing boulder-strewn material, one of its important jobs on the Trans-Canada job spread! Fifteen International machines helped keep this job on schedule!

How International Superior *full-time pipe handling*

—on Trans-Canada

The International Drott TD-18 Skid-Shovel was a dual purpose machine on the job. Part of the time it was a tow tractor, pulling an air compressor—but mainly it was used over rough, hummocky terrain to carry bags of sand which were used as "pipe cushion." It also moved right-of-way mats over soft spots.

Exclusive TD-24 mud-and-mountain beating margin of flotation! With power-matching weight balanced over its center track roller and up to 18% less poundage psi on its tracks than other makes, the TD-24 Superior sideboom gets extra, full flotation traction. That's why the TD-24 handles extra-big pipe loads across bogs or over steep-pitched hummocks, without tipping or miring down!

Exclusive years proved TD-24 Planet Power steering—to feed full-time "live" power to both tracks to turn smoothly, as sharply or gradually as desired—without jerks! Load-limiting "dead-track drag" on turns is eliminated!

Exclusive TD-24 fingertip hydraulic braking and foot decelerator—help give positive pipe-carrying control by exact regulation of sideboom and tractor motion.

TD-24 Sideboom

exclusives pay off

Pipeline, for Houston Contracting Company!

Exclusive reach-easy controls in vertical cluster, with horizontal lever travel. Adds unmatched operator convenience.

Exclusive wear-saving cable alignment with fleeting sheaves—with individual drum shaft mounting to position the cable in the center of the boom. Prevents piling and crushing of the cable!

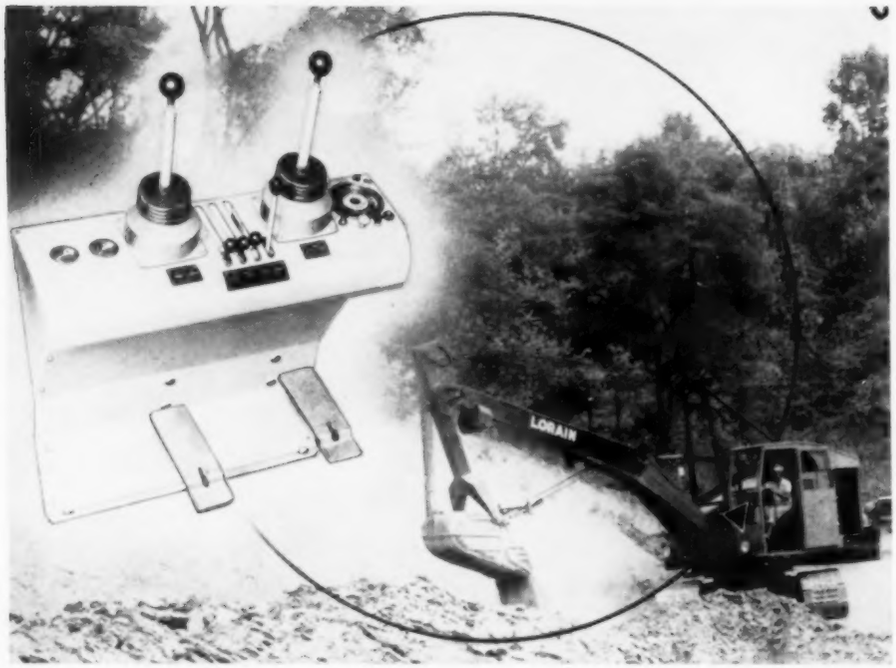
Exclusive International Cerametallic-faced engine clutch—for full-load power transfer efficiency, anywhere, anytime. Immune to heat or cold, this dry-type clutch of simplified design eliminates the servicing frequency demanded by "oil-cooled" clutches!

Exclusive, spread-speeding, on-the-go Hi-Lo shifting. In either the Torque Converter or Gear-Drive model, the TD-24 gives instant, stall-preventing, Hi-Lo shifting without stopping, or declutching. Fingertip matching of speed to load saves time that pays off in increased production!

Get in the driver's seat and prove TD-24 sideboom advantages to yourself compared to any other king-sized rig on tracks. And see how bonus-powered TD-18, TD-14, and TD-9 sidebooms also outperform any other units in their size classes. See your International Superior Distributor for a demonstration of the boom and tow equipment you need!

International Harvester Company, Chicago 1, Illinois

INTERNATIONAL® SUPERIOR



Power Controls

Thew Shovel Company of Lorain, Ohio, has announced that two-lever "joy stick" power controls are now available on the Loraine 26, a crawler mounted machine with a heavy-duty three-fourths yard rating as a shovel and 17½ tons as a crane.

The controls affect swing, travel, hoist, crowd and retract, or powering load lowering and boom derricking by hydraulic power. The conventional three or more levers are reduced to two.

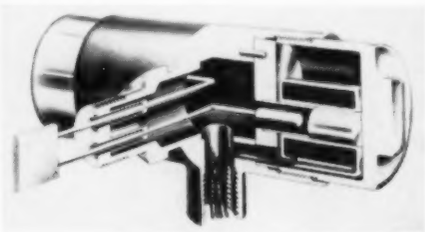
The "26" when used as a crane can be equipped with the new internal gear boom hoist that provides a final planetary gear reduction drive to the drum which gives greater precision by providing slower speeds and improved control.

For more data, circle **No. E10** on Readers' Service Card, last page this issue.

Level Control

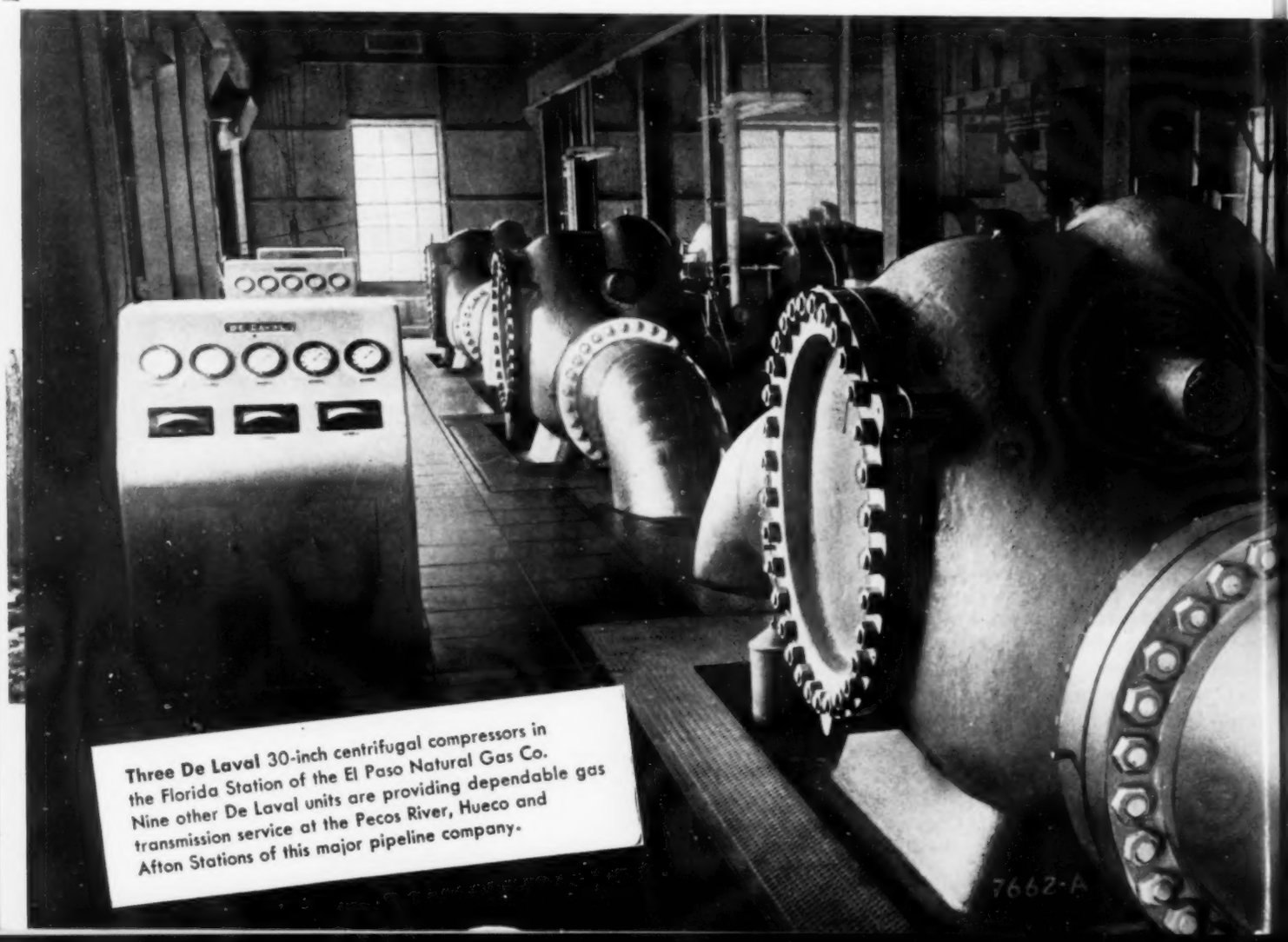
Automation Products, Inc., of Houston, has announced a new level control for the detection of liquid, solid and slurry levels.

The Model CL-10 Dynatrol utilizes a new design principle for accurate and versatile high or low point detection or narrow range proportional control of liquid, solid and slurry levels. The control has a positive acting electrical output signal that varies with the amount of immersion of the 120 cps vibrating paddle in the medium being detected. The output signal can be used to control the operation of any type of electrical equipment. Unique design allows sensitive transmission of vibrational energy from the driver end to the sensing paddle and back to the output signal end through a linkage

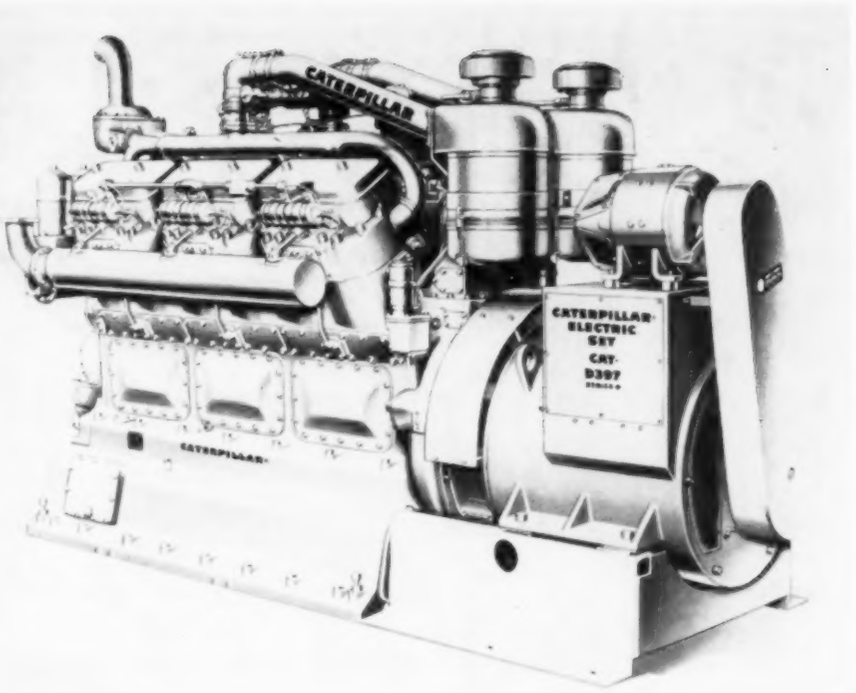


path welded to rigid metal pressure seals at the node points where zero amplitude of vibration occurs.

For more data, circle **No. E11** on Readers' Service Card, last page this issue.



Three De Laval 30-inch centrifugal compressors in the Florida Station of the El Paso Natural Gas Co. Nine other De Laval units are providing dependable gas transmission service at the Pecos River, Hueco and Afton Stations of this major pipeline company.



Electric Set

A new electric set combining high output and compactness has been introduced in the form of the Cat D397 Spark-Ignition electric set by Caterpillar Tractor Company.

Available with either the new SRCV Cat generator or an optional two-bearing generator, the new electric set is rated at 250 K.W. Power for the Spark-Ignition electric set is provided by the V-type, D397 Diesel Engine, equipped with simple alterations for fuel carburetion and magneto ignition system, allowing the set to operate on methane, butane, propane or field gases.

The low-tension distribution system for ignition used in the new power unit provides a hotter, more positive spark in the cylinder than with other systems. A magneto supplies low-tension voltage to high-tension transformers located near each cylinder. Short, high-voltage leads prevent leakage, arcing and current loss.

(This item supplements Caterpillar Tractor Company data on Pages 67-69 of the Pipe Line Composite Catalog, 1st Edition).

For more data, circle **No. E12** on Readers' Service Card, last page this issue.

Plastic Zippertubing

A plastic zippertubing, designed originally for wire harness sheathing in the electrical circuits of aircraft, is beginning to be used in petroleum, welding, building, engineering and construction industries. The material is manufactured by Zippertubing Company of Los Angeles.

Groups of wires, tubes, pipes and hoses

DE LAVAL

CENTRIFUGAL COMPRESSORS

on the job at El Paso Natural Gas

De Laval centrifugal compressors offer many important engineering features. (1) They are designed to handle an increased ultimate flow, can be quickly converted to larger capacities by replacing the impeller, diaphragm and a few minor parts. (2) The high pressure shaft seal eliminates leakage, consumption of sealing oil is negligible. (3) There is only one moving part—the rotor—which has ample clearance. (4) Units are compact, require smaller foundations and smaller stations. (5) First costs and installation costs are low.

Bulletin 503 gives data on De Laval Centrifugal Compressors. Write for your copy.

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

884 Nottingham Way, Trenton 2, New Jersey

DL375

YOUR FRIENDS AT SPI ALL WISH FOR YOU A MERRY CHRISTMAS AND A HAPPY NEW YEAR!

SPI

standard pipeprotection inc.

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can be protected by Zippertubing from abrasion, corrosion, critical environmental conditions and excessive wear by the use of this plastic jacket with its zipper-type closure. Not only can the encased hoses or pipes be clearly and simply identified but installation is quick and easy with any zipper-operated item.

The zipper pull-tab used to close zippertubing is detachable and may be "unzipped" and re-used where required or permanently sealed with a sealer provided by the manufacturer. When sealed, the seam will withstand a linear strength test of 45 psi. Sizes range from ⅜ inch ID and larger in increments of ⅛ inch. The tubing is available in nine colors and in continuous lengths from 20 to 1000 feet.

For more data, circle **No. E13** on Readers' Service Card, last page this issue.

Casing Cradle

The New WmSON Three-Way Casing Cradle is positioned in casing ends after drag section is in place and tie-in welds are made.

The flexible non-conductive cradle which encircles the pipe prevents the drag section from touching the casing ends should it ride the side or top of casing.

In addition to supporting the pipe at casing ends, three-way casing cradles also provide for easy installation of casing bushings. They are manufactured by T. D. Williamson, Inc., of Tulsa.

For more data, circle **No. E14** on Readers' Service Card, last page this issue.

Water Detector

Although designed primarily for the detection and control of basic sediment and

THE MEANING OF FLEXITALLIC BLUE

In every field of high-pressure seal—for pipe flanges, pressure vessels, and process equipment—engineers know and recognize Flexitallic Spiral-Wound Gaskets. The blue dye in the Canadian asbestos filler provides positive product identification.

Flexitallic Blue tells the user that the gasket is made by an engineering organization devoted exclusively to the manufacture of Spiral-Wound Gaskets since 1912.

Flexitallic Blue is your assurance that the compression response of the gasket is directly related to the bolting for each application.

Flexitallic Blue is a pledge that manufactured gaskets always conform to specification.

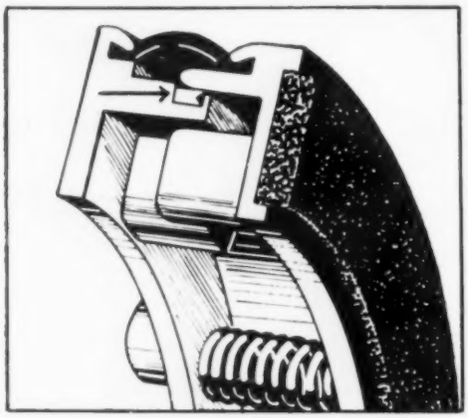
When you see Flexitallic Blue, you can be sure it's a genuine Flexitallic Spiral-Wound Gasket.

FLEXITALLIC GASKET CO.
8th & Bailey Sts., Camden 2, N.J.
Representatives in principal cities

Flexitallic®
SPIRAL-WOUND GASKETS
FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

* Flexitallic is a registered trade name. No one else can make a Flexitallic Gasket. Look for *Flexitallic Blue* — it's our exclusive blue-dyed Canadian asbestos filler.

Sure-Seal® ROLLER SEALS



Inner "chevron" seal prevents loss of lubricant

Double Protection For "Cat" and I.H.C. Tractors

Rollers on Caterpillar and International Harvester tractors are doubly protected against lubricant loss with Sure-Seal Roller Seals. In addition to tough, oil-resisting bellows seal, there is an exclusive inner "chevron" seal. Keeps lubricant in—dirt and water out. High pressure lubrication seals it tighter—can't blow out!

Other Sure-Seal features: Heat-resistant leather facing is double-tanned, chemically treated for heat and wear resistance. Equal-pressure, self-aligning springs. Protect your tractor with Sure-Seal.

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Sure-Seal Equipment Co.

1820 N. W. 25th Ave., Portland 10, Oregon

Announcing Three Complete Locations to Serve You!

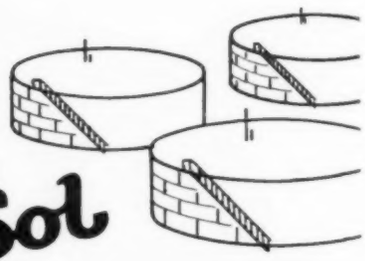
HOUSTON. Wayne A. Johnson, President, directs the company's activities from the Main Office in Houston. Mr. Johnson is well known in the cathodic protection profession and is the author of many technical articles in the field. P. O. Box 19177, Houston, Texas.

GREAT BEND, KANSAS. Harvey Fanshier, Mid-Western representative for Corrosion Rectifying Company is a graduate of Kansas State College with extensive experience in salt water disposal and corrosion prevention. Rt. 2, Great Bend, Kansas.

NEW ORLEANS, LA. James T. Condry, New Orleans representative, is a graduate Electrical Engineer in charge of evaluation, design, installation and materials sales for the Louisiana territory. He has wide experience in marine and offshore installations. 2322 Airline Highway, Kenner, Louisiana.

CORROSION RECTIFYING CO., INC.
5310 Ashbrook — Phone MO 7-6659
P. O. Box 19177 • Houston, Texas

RECLAIM TANK BOTTOMS with BrakeSol



the most effective chemical for treating

PARAFFIN

The money you make on reclaimed tank bottoms by using BRAKESOL will be substantially more than the cost of treating . . . including chemical and labor. Safe for use in production, pipeline and refinery equipment . . . Contains no chlorides, sulphides or other halides. BRAKESOL Treating Engineers have the experience and know-how to do a successful job. Contact them now!

Treating Engineers Available at These Locations

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Cormi, Illinois 7191
Casper, Wyo. 2-3453

Dallas, Texas DAvis 4-4884
Ft. Morgan, Colorado UNderhill 7-6389
Houston, Texas HOmestead 5-6648
Kilgore, Texas 3210
Lovington, N. M. 6-5954

New Ibera, Louisiana EMerson 9-3498
Odessa, Texas EMerson 6-4511
Pampa, Texas MOhawk 9-9994
Edmonton, Alberta, Oklahoma City, Okla. VI 3-6629 WH 9-5561

BrakeSol INC.

P. O. BOX 9506 • OKLAHOMA CITY, OKLA.
EXPORT DISTRIBUTOR: THE NATIONAL SUPPLY CO., EXPORT DIVISION

water in crude oil, the BS&W Monitor could also be called the Dielectric Constant Monitor for use to detect and control instantly excessive moisture or other elements which affect the dielectric constant of a piped material.

The equipment has been announced by Instruments, Inc., of Tulsa.

A fixed capacitor or probe, extending into the pipe through which the material flows is sensitive to variations as slight as

0.1 of 1 percent in the dielectric constant of any material passing between it and the wall of the pipe. Information regarding such variations is transmitted to the control unit, which actuates valves to re-route or by-pass the contaminated material until the condition can be corrected.

Pilot lights at the top of the instrument indicate at all times the condition of the material, whether it is merchantable, by passing and whether it is beyond the limits of contamination for which the "limit" dial is set.

For more data, circle **No. E15** on Readers' Service Card, last page this issue.

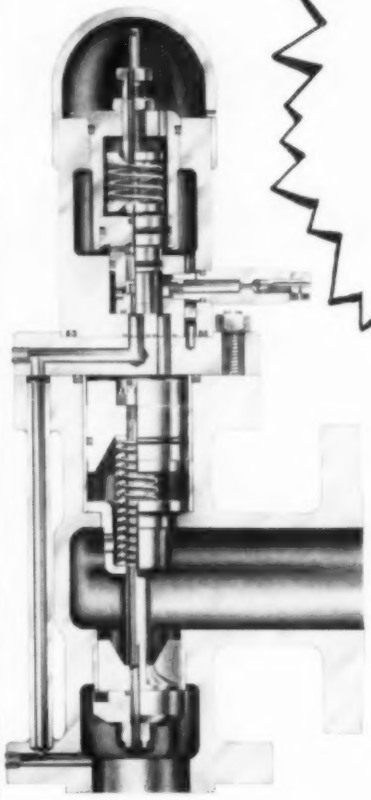
Transmission System

Bristol Company of Waterbury, Conn., has announced that a new electronic transmission system based on the use of a differential transformer transmitter and an electronic Dynamaster receiver was exhibited recently.

This system will make measurements of such variables as pressure, differential pressure, liquid level, temperature and mechanical motion, and convert them to ac voltage signals proportional to the measurements. The ac signals are transmitted continuously and instantaneously to remote self-balancing electronic Dynamaster receivers. The receivers can be mounted up to 1000 feet from the transmission center.

Bristol's new miniature Dynamaster self-balancing receivers in interchangeable indicating or three-inch strip-chart recording types can be used with the transmitters, as well as the standard 12-inch strip-chart or round-chart Dynamaster recorders. The miniature receivers are ideal for use in centralized instrument panels or graphic panels, as they match the company's line of Metagraphic pneumatic control receivers in appearance. The receivers occupy a panel space five inches square.

For more data, circle **No. E16** on Readers' Service Card, last page this issue.



INSTANTANEOUS OPENING FOR GAS OVERPRESSURES

MODEL 416 RELIEF VALVE ASSURES POSITIVE PROTECTION

The new pilot operated Kinzbach Model 416 Relief Valves were designed to be the most dependable relief valve for gas services. Whenever line pressure reaches set pressure the pilot valve opens and full line pressure is applied to the main valve, opening it through its full stroke without pressure accumulation.

This flat-seated pilot valve has a stainless steel loading spring which makes possible an extremely accurate set pressure and years of trouble-free performance. Some other advantages of this simple and rugged valve include its positive leakproof seating, easy functional testing below set pressure, and convenient bench setting for both opening and closing pressure. The Model 416 Valves are Certified under A.S.M.E. Unfired Pressure Vessel Code (Sec. VIII, Par. UG-131).

For complete details on this and other Kinzbach Relief Valves, write for new catalog.

KINZBACH TOOL CO INC

KINZBACH TOOL CO., INC.
P. O. Box 277 • Houston, Texas

EXPORT OFFICE:
74 TRINITY PLACE
NEW YORK, N. Y.

A pipeline pumping station—powered by a gas turbine and equipped with a heat exchanger—has a decided economic edge over other stations. Manpower, for example, is as little as 20% of that needed by stations powered by diesel, steam or gas engines.

What part does the heat exchanger play? If it's an APCO extended sur-

face regenerator, it can recover up to 80% of the available heat in the gas turbine exhaust . . . and thereby cut fuel by 30%.* What's more, it takes less than 500 manhours to erect a unit on a 5000 hp cycle. Maintenance needed thereafter: zero. For details, contact:

Air Preheater Corp.,
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New York, N. Y.

* At 1500 F, a 6-1 pressure ratio, and a designed effectiveness of 75%.

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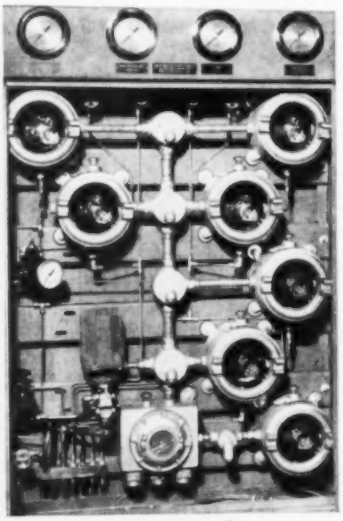
THE LIFE OF THE EQUIPMENT IT SERVES

MERCOID® SAFETY CONTROL PANELS



MERCONTROL®

Here are a few of the many functions Mercoid Controls perform in safeguarding major pipeline equipment:

- *High discharge pressure*
- *High case pressure*
- *Low suction pressure*
- *High case temperature*
- *High bearing temperature*
- *Lube oil pressure*
- *Instrument air pressure*
- *Mechanical seal failure*
- *Differential pressure for pressurized control rooms*

Our engineers are at your service —send in your control problem.

THE MERCOID CORPORATION
4201 Belmont Ave., Chicago 41, Ill.

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Equipment

The complete line of pipe line equipment manufactured by Caterpillar Tractor Co. is detailed in a two-color brochure recently published by that company.

Titled "Pipelining," the brochure deals with pipelayers, and hydraulic pipelaying attachments for tractors. In addition, the use of Caterpillar Diesel Engines as power units for such pipe line equipment as ditchers and arc-welders is also explained.

The eight-page publication is fully illustrated with pictures of pipe line equipment working on various pipe line jobs throughout the country. Accompanying the pictures are statements concerning the dependability of this equipment by the pipe line contractors whose spreads are pictured.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Non-Destructive Testing

Two new ultrasonic testing bulletins are now available from Branson Instruments, Inc. These application data sheets discuss the uses of the Vidigage, an ultrasonic resonance instrument, for quick and accurate detection of corrosion and laminar flaws and the measuring of metal or plastic thicknesses.

Advantages of ultrasonic corrosion inspection are discussed in one of the bulletins. Requiring access to only one surface, the Vidigage is ideal for checking piping, oil and water storage tanks, ship hulls and bulkheads, and other components not easily reached from both sides.

The other bulletin describes methods of ultrasonic flaw detection.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Control Systems

A bulletin from Builders-Providence, Inc. and Warren Manufacturing Co. describes how centralized supervisory control systems can utilize the advantages of transistorized audio-tone transmission.

Up to 18 functions, telemetering and controlling, may be transmitted over a single pair of private or leased wire, carrier current, radio or microwave mediums. This type of transmission has proved ideal in economically centralizing the control of remote functions found in both municipal and industrial applications.

To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

Gaskets

A complete line of gaskets, back-up rings and "O" rings that are impervious to the most destructive acids, alkalis, corrosives and solvents at temperatures from —120°F to +500°F. are described in a recently published brochure by DuPont Teflon Company.

Information includes service and mechanical recommendations, data on operating pressures and standard sizes and dimensional details.

To get a copy, circle **No. E20** on Readers' Service Card, last page this issue.

Power Supply

General Electric Company has published a bulletin on its new Transistorized Power Supply for two-way radio units, which provides advantages of transistor power without obsoleting the user's existing radio equipment.

The Transistorized Power Supply makes possible system modernization without expensive maintenance.

To get a copy, circle **No. E21** on Readers' Service Card, last page this issue.

Power Units

International Harvester Company has announced a new 12-page catalog covering its line of six diesel power units. The booklet tells of the three four cylinder units, the UD-281, UD-350, and UD-14A, which range in horsepower from 60 to 76, and on the more-powerful six cylinder jobs, the UD-525, UD-18A, and the UD-1091, which embrace a wider range of power, from 115 to 200 hp.

Diagrams, cross sections, exploded views and photo close-ups illuminate the features of the units. Such design features as the full-flow, by-pass cooling system in the UD-1091, the new open-face, single-orifice injection nozzle in all diesel units, and the new Lanchester engine balancer to provide extra-smooth operation in the four-cylinder engines are explained pictorially.

To get a copy, circle **No. E22** on Readers' Service Card, last page this issue.

Offshore Pipe Laying Movie

"It's Magic" is the title of a new 16 mm, 25-minute color film with magnetic sound available for showing to pipe liners and other industry groups from Marine Gathering Company. The movie describes construction methods in laying offshore pipe lines.

Taken on the Magic's first job laying a 25-mile system of 6, 8, and 12-inch lines off Grand Isle, La., the film shows all steps in operation of laying pipe from an inclined center line work ramp and details of activities at all six work stations. It also highlights the living conditions for the pipe laying crew, inspectors and service personnel aboard the new offshore barge.

To get a copy, circle **No. E23** on Readers' Service Card, last page this issue.

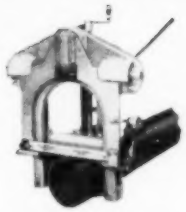
Wire Rope Manual

A wire rope manual prepared by Macwhyte Company features subjects such as "Inspection of Wire Rope," "Methods of Lubricating Wire Rope," "Use and Abuse of Wire Rope" and "Sheave Maintenance."

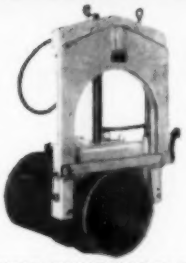
The manual also contains sections devoted to strengths and weights of wire rope, cable assemblies and rated capacity of slings.

To get a copy, circle **No. E24** on Readers' Service Card, last page this issue.

WACHS *Portable*
POWER AND MANUAL PIPE CUTTERS
2" TO 72" CAPACITY

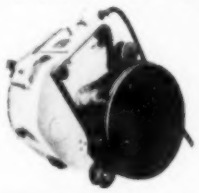


WACHS GUILLOTINE SAW
2" to 8" Capacity
Electric or Air Drive

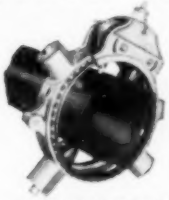


"BIG" GUILLOTINE SAW
10" to 16" Capacity

WACHS CHICAGO



WACHS NATIONAL SAW
"The milling machine on wheels"
Cuts 10" to 72" Pipe



WACHS STRICKLER
RATCHET CUTTER
"Lathe Type Cuts"
5 sizes—2½" to 24" Capacity

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THE E. H. WACHS COMPANY
Manufacturers of Engines, Valves and Machinery since 1883
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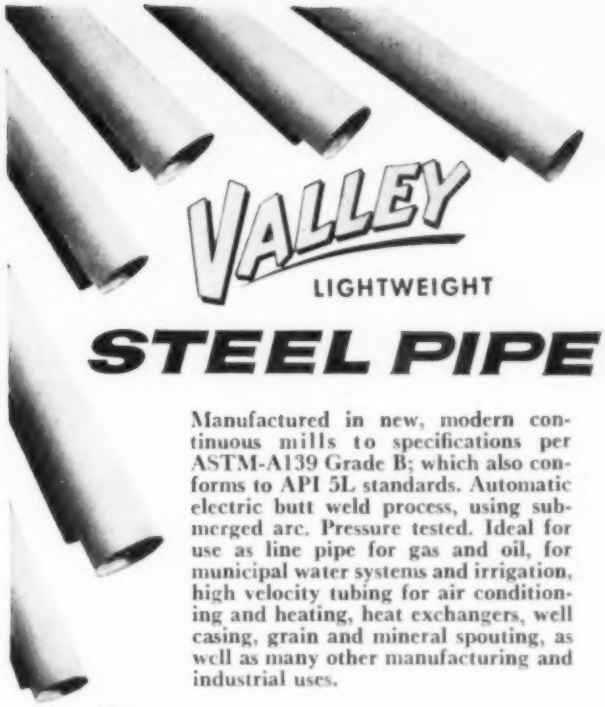

VALLEY
LIGHTWEIGHT
STEEL PIPE

Manufactured in new, modern continuous mills to specifications per ASTM-A139 Grade B; which also conforms to API 5L standards. Automatic electric butt weld process, using submerged arc. Pressure tested. Ideal for use as line pipe for gas and oil, for municipal water systems and irrigation, high velocity tubing for air conditioning and heating, heat exchangers, well casing, grain and mineral spouting, as well as many other manufacturing and industrial uses.

Available in 6", 6⅝", 8", 8⅝", 10", 10¾" diameters, from 16 gauge up to and including .188 wall thickness; 20, 30 or 40-foot lengths; and in plain or belled ends. Quotations available for Victaulic or Dresser end processing, and coating.

VALLEY
Manufacturing Company Valley, Nebraska

Available for immediate delivery.
Write or call for full specification and production data to: **Steel Pipe Division**

100% Sales Acceptance on FREE Trial Offer

of the all new

Fisher

"Electronic Witch"
M-SCOPE
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In your field, 100% of those who take the famous "Electronic Witch" on FREE TRIAL actually purchase it! Here is absolute proof of unsurpassed performance. Outperforms any pipe locator on the market regardless of price.

Test this new Pipe and Cable Finder under YOUR actual working conditions. State on your company purchase order that you want 10 day FREE TRIAL OFFER. Your only expense is the nominal shipping charge.

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with indestructible Fiberglas cabinets.

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Complete Pipe Finding, Leak Detecting and Corrosion Control Equipment.

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HOT & COLD APPLIED COATINGS

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PIPELINE FELT, PADDING & GLASS PIPE WRAP

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INDUSTRIAL CORROSION PREVENTION

how to trick Your Boiler

into Maximum Performance, is no trick at all

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PURE COLLOIDAL CONCENTRATE

Ounces Only Once a Week
Remove and Prevent Boiler Scale

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for Maximum, Clean Burnability of ALL Grades of Fuel Oil—You Can Count On

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THE HOMOGENIZING FUEL OIL TREATMENT

Stocked by Leading Supply Houses
Gulf Coast District Representatives

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1717 Chenevert Street, Houston 2, Texas

AMERICAN SAND-BANUM CO.
ESTABLISHED 1926
MEADOW BROOK NATIONAL BANK BUILDING
FREEPORT, NEW YORK

REPAIR LEAKS
QUICKLY—PERMANENTLY

SKINNER-SEAL PIPE JOINT CLAMPS stop leaks at joints. Put on under pressure—without interruption of service. Quick, simple, lasting repair. Sizes 1/2" to 24" incl. in stock.

SKINNER-SEAL COLLAR LEAK CLAMP—designed to stop every type of collar leak in oil and gas lines. Sizes: 2" to 13" inclusive.

M. B. SKINNER COMPANY
SOUTH BEND 21, INDIANA, U. S. A.

Advertisers' Index

• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current 1st (1957-58) edition of The Pipe Line Composite Catalog.

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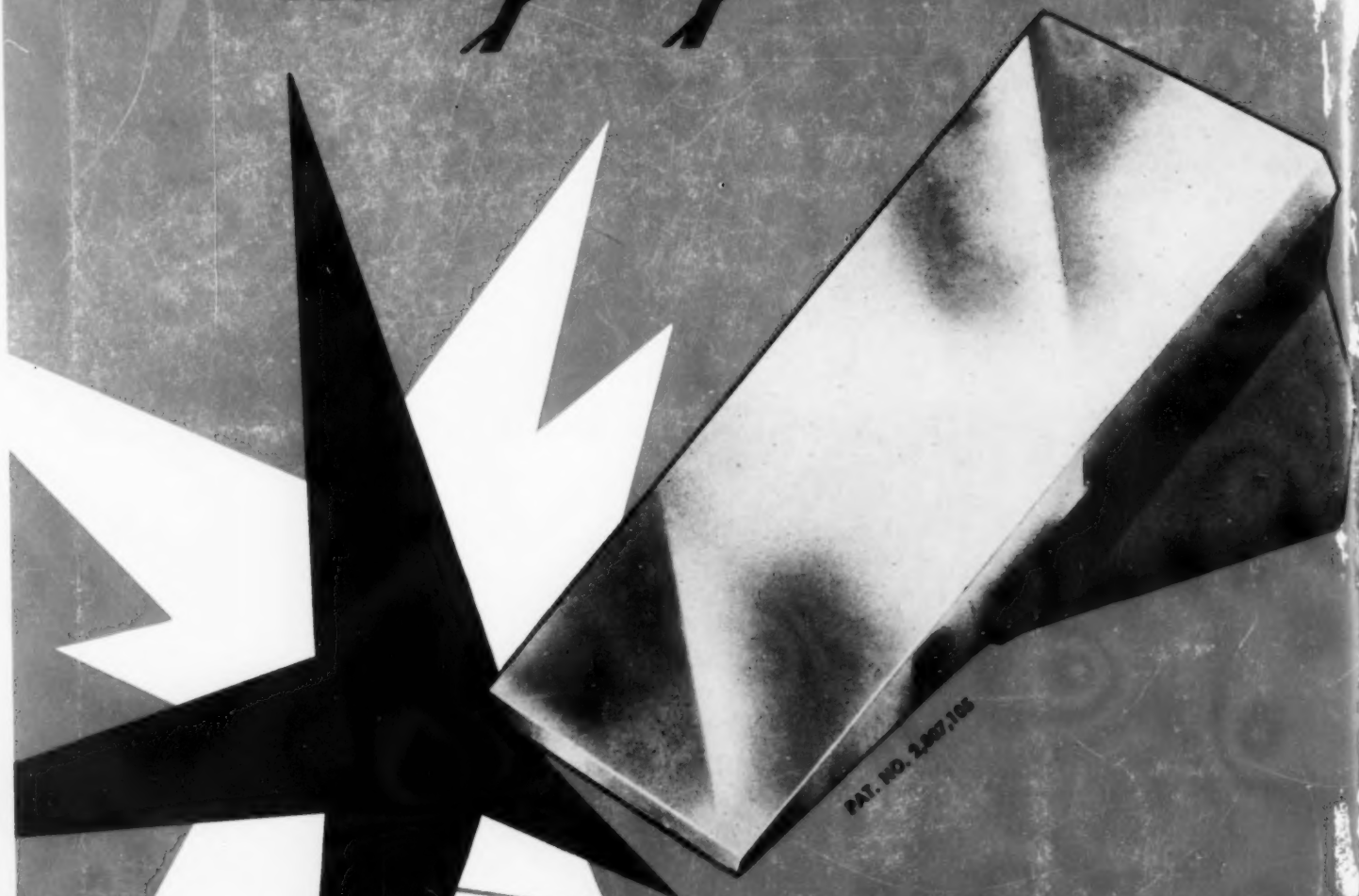

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